e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(10); 958-964

Original Research Article

Correlation of Platelet Indices with Severity and Maternal Outcomes in Women with Preeclampsia: A Hospital-Based Observational Study

Sushma Purohit

Assistant Professor, Department of Obstetrics and Gynecology, Shri Rawatpura Sarkar Institute of Medical Sciences and Research, Raipur, Chattisgarh, India

Received: 23-08-2026 / Revised: 28-09-2026 / Accepted: 29-10-2026
Corresponding Author: Sushma Purohit
Conflict of interest: Nil

Abstract:

Background: Preeclampsia is associated with platelet activation and alterations in platelet indices. This study evaluated the correlation of platelet indices with disease severity and maternal outcomes in women with preeclampsia.

Material and Methods: This hospital-based observational study included 140 women diagnosed with preeclampsia. Demographic, obstetric, clinical and laboratory parameters were recorded. Platelet count, mean platelet volume (MPV), platelet distribution width (PDW) and plateletcrit (PCT) were compared according to disease severity and maternal outcomes. Correlations between platelet indices, blood pressure and gestational age were also assessed.

Results: Among 140 participants, 62 (44.3%) had preeclampsia with severe features. Compared with women without severe features, these women had significantly lower platelet counts and PCT, and higher MPV and PDW ($P<0.001$). Platelet count and PCT showed significant negative correlations with blood pressure, whereas MPV and PDW showed positive correlations ($P<0.001$). Adverse maternal outcomes occurred in 32 (22.9%) women. These women had significantly lower platelet counts and PCT and higher MPV and PDW compared with those without adverse outcomes ($P<0.001$). Caesarean section was performed in 70% of participants.

Conclusion: Alterations in platelet indices were significantly associated with preeclampsia severity and adverse maternal outcomes. These parameters may provide useful supplementary information for maternal risk assessment.

Keywords: Preeclampsia; Platelet Indices; Mean Platelet Volume; Platelet Distribution Width; Plateletcrit; Maternal Outcomes.

DOI: 10.25258/ijcpr.18.10.130

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0) and the Budapest Open Access Initiative (http://www.budapestopenaccessinitiative.org/read), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Preeclampsia is a multisystem hypertensive disorder of pregnancy, generally developing after 20 weeks of gestation, characterized by new-onset hypertension with proteinuria or maternal organ dysfunction. It remains a major contributor to maternal and perinatal morbidity and mortality. Its pathophysiology involves abnormal placentation, impaired uteroplacental blood flow and widespread endothelial dysfunction, affecting organs such as the kidneys, liver and cerebral circulation. Severe complications include eclampsia, acute kidney injury and hepatic dysfunction [1].

Platelet activation and haemostatic alterations play important roles in preeclampsia. Endothelial injury and increased platelet consumption may reduce circulating platelet counts, while changes in platelet production and morphology are reflected in indices such as mean platelet volume (MPV), platelet distribution width (PDW) and plateletcrit (PCT). These parameters provide information about platelet size, volume variability and total circulating platelet volume. Their routine availability through complete blood count analysis makes them inexpensive and accessible potential markers for preeclampsia assessment [2].

Recent studies have explored the association between platelet indices and preeclampsia severity. A systematic review and meta-analysis by Woldeamanuel et al. reported significantly lower platelet counts in affected women [2]. Similarly, Udeh et al. observed reduced platelet counts and increased MPV and PDW in early-onset preeclampsia, suggesting their potential role in identifying severe disease [3]. A prospective cohort study from Gujarat by Thakkar et al. also demonstrated significant alterations in platelet count, MPV and PDW among women developing early-onset preeclampsia [4].

However, findings regarding individual platelet indices remain inconsistent. Agarwal et al. reported gestational variations in platelet parameters, although their regression models did not demonstrate significant predictive performance [5]. A hospital-based study from eastern India also examined platelet count, MPV, PDW and PCT in relation to disease severity and maternal outcomes, highlighting their potential clinical relevance while emphasizing the need for further evaluation [6]. These findings suggest that combined assessment of platelet indices may provide more comprehensive information than platelet count alone.

Therefore, the present study aimed to evaluate the association of platelet indices with preeclampsia severity and maternal outcomes. It also examined the relationship of platelet count, MPV, PDW and PCT with clinical parameters, particularly systolic and diastolic blood pressure and gestational age at diagnosis, to assess their potential utility in maternal risk stratification.

Materials and Methods

Study design and setting: The study was designed as a hospital-based prospective observational study to evaluate the correlation of platelet indices with the severity of preeclampsia and maternal outcomes at a tertiary care teaching hospital.

Study population: The study population comprised pregnant women diagnosed with preeclampsia at or beyond 20 weeks of gestation. Eligible participants were recruited consecutively during the study period after obtaining written informed consent.

Sample size calculation: The sample size was determined using the formula for estimating a correlation coefficient. The calculation was based on an anticipated correlation coefficient of 0.25 between platelet indices and the severity of preeclampsia, with a 5% level of significance (two-sided) and 80% statistical power. Considering these assumptions, the minimum required sample size was approximately 123 participants. After accounting for a possible 10% attrition rate, the required sample size was approximately 137. Accordingly, a target sample size of 140 women with preeclampsia was proposed for the study.

Inclusion criteria: The following participants were included in the study:

1. Pregnant women aged 18 years or above.
2. Women with a singleton pregnancy at or beyond 20 weeks of gestation.
3. Women diagnosed with preeclampsia according to established diagnostic criteria.
4. Women who provided written informed consent to participate in the study.

Exclusion criteria: The following participants were excluded:

1. Women with pre-existing chronic hypertension.
2. Women with pre-existing renal or hepatic disorders.
3. Women with known haematological disorders or pre-existing thrombocytopenia.
4. Women with gestational thrombocytopenia diagnosed before the onset of preeclampsia.
5. Women with active infections or systemic inflammatory conditions.
6. Women receiving medications known to significantly affect platelet function or platelet count.
7. Women with multiple pregnancies.
8. Women who declined consent or had incomplete clinical and laboratory records.

Diagnostic criteria and classification of preeclampsia: Preeclampsia was diagnosed in women who developed new-onset hypertension after 20 weeks of gestation, characterized by systolic blood pressure of 140 mmHg or higher and/or diastolic blood pressure of 90 mmHg or higher on two occasions at least four hours apart, in previously normotensive women.

The diagnosis was established in the presence of proteinuria, defined as urinary protein excretion of 300 mg or more over 24 hours, a urine protein-to-creatinine ratio of 0.3 or higher, or a dipstick reading of 2+ when quantitative assessment was unavailable. Preeclampsia was also diagnosed in women with new-onset hypertension accompanied by evidence of maternal organ dysfunction, even in the absence of proteinuria.

The severity of preeclampsia was classified according to the presence or absence of severe features, based on the American College of Obstetricians and Gynecologists (ACOG) recommendations. Women who did not demonstrate any of these severe features were classified as having preeclampsia without severe features [7].

Data collection procedure: A structured case record form was used to collect relevant demographic, obstetric, clinical, and laboratory information from each participant. The demographic details included age, residential background, and relevant medical history. Obstetric information included gestational age at diagnosis, gravidity, parity, previous obstetric complications, and antenatal booking status. Clinical parameters, including systolic and diastolic blood pressure, presence of pedal oedema, and associated symptoms such as headache, visual disturbances, and epigastric pain, were documented. Relevant laboratory investigations included complete blood count, platelet count, liver function tests, renal function tests, and urine protein assessment.

Assessment of platelet indices: Venous blood samples were collected from all participants under

aseptic precautions into ethylenediaminetetraacetic acid (EDTA)-containing anticoagulant tubes. The samples were analysed using an automated haematology analyser. The platelet parameters recorded included platelet count (PC), mean platelet volume (MPV), platelet distribution width (PDW), and plateletcrit (PCT). Platelet count represented the total number of circulating platelets, expressed as cells/µL. Mean platelet volume indicated the average volume of individual circulating platelets and was expressed in femtolitres (fL). Platelet distribution width reflected the variability in platelet size, also expressed in femtolitres (fL). Plateletcrit represented the percentage of total blood volume occupied by circulating platelets and was expressed as a percentage.

The platelet indices were assessed at the time of diagnosis of preeclampsia. Blood samples were processed within the laboratory's validated time interval to minimize preanalytical variations, particularly those affecting MPV.

The values of platelet indices were subsequently compared between women with preeclampsia without severe features and those with preeclampsia with severe features.

Assessment of maternal outcomes: All enrolled participants were followed from the time of diagnosis until delivery and throughout their hospital stay in the immediate postpartum period. Maternal complications and clinical outcomes were documented. The occurrence of maternal complications was evaluated in relation to the platelet indices recorded at the time of diagnosis. The association between abnormal platelet parameters and adverse maternal outcomes was also assessed.

Statistical Analysis: Data were entered into Microsoft Excel and analysed using IBM SPSS version 26.0. Continuous variables were expressed as mean ± standard deviation or median with interquartile range, while categorical variables were presented as frequencies and percentages. Normality was assessed using the Shapiro–Wilk test. Appropriate parametric or non-parametric tests (Student's t-test or Mann–Whitney U test) were used for continuous variables, and the Chi-square or Fisher's exact test for categorical variables. Pearson's or Spearman's correlation was used to assess associations between platelet indices and clinical parameters. Multivariable logistic regression and receiver operating characteristic (ROC) curve analyses were performed, where appropriate, to evaluate independent associations and the predictive performance of platelet indices. A two-sided P value of less than 0.05 was considered statistically significant.

Results

A total of 140 women with preeclampsia were included in the study. The largest proportion of participants belonged to the 26–30-year age group. Normal BMI was the most common category, and urban and rural participants were represented in nearly equal proportions. Primigravida and multigravida women were almost equally distributed. Most participants had booked pregnancies, and the majority had no previous obstetric complications. A slightly higher proportion of women presented with preeclampsia without severe features (Table 1).

Comparison of laboratory parameters revealed significant differences in several platelet indices between the two severity groups. Women with severe features had significantly lower platelet counts and plateletcrit, whereas MPV and PDW were significantly higher. Total leukocyte count, AST and serum creatinine were also significantly elevated in women with severe features. However, the difference in haemoglobin levels between the groups was not statistically significant (Table 2).

Correlation analysis demonstrated significant negative correlations of platelet count and PCT with systolic and diastolic blood pressure, whereas MPV and PDW showed significant positive correlations with both blood pressure parameters. With increasing gestational age, platelet count and PCT showed positive correlations, while MPV and PDW demonstrated negative correlations. All these correlations were statistically significant (Table 3).

Regarding maternal outcomes, caesarean section was the predominant mode of delivery. Among the recorded maternal complications, ICU admission was the most frequent, followed by HELLP syndrome and postpartum haemorrhage. Overall, 32 women experienced at least one adverse maternal outcome, while no maternal mortality was recorded during the study period (Table 4).

Comparison of platelet indices according to maternal outcomes demonstrated significant differences between the two groups. Women who developed adverse maternal outcomes had significantly lower platelet counts and PCT values, whereas MPV and PDW values were significantly higher than those observed in women without adverse maternal outcomes. All four platelet indices showed statistically significant differences between the groups (Table 5).

Table 1: Sociodemographic and obstetric characteristics (n = 140)

Characteristic	n	%
Age (years)		
18–25	38	27.1
26–30	57	40.7
31–35	32	22.9
>35	13	9.3
BMI (kg/m²)		
<18.5 (underweight)	6	4.3
18.5–24.9 (normal)	58	41.4
25.0–29.9 (overweight)	51	36.4
≥30.0 (obese)	25	17.9
Residence		
Urban	74	52.9
Rural	66	47.1
Gravidity		
Primigravida	69	49.3
Multigravida	71	50.7
Gestational age at diagnosis (weeks)		
<34	43	30.7
34 to 36+6	47	33.6
≥37	50	35.7
Antenatal booking status		
Booked	94	67.1
Unbooked	46	32.9
Previous obstetric complication		
Present	21	15.0
Absent	119	85.0
Severity of preeclampsia		
Without severe features	78	55.7
With severe features	62	44.3

Table 2: Laboratory parameters and platelet indices by severity of preeclampsia

Parameter	Without severe features (n = 78)	With severe features (n = 62)	P value
Haemoglobin (g/dL)	11.2 ± 1.2	10.8 ± 1.3	0.067
Total leukocyte count (/µL)	10,240 ± 2,180	11,180 ± 2,460	0.021
Platelet count (×10³/µL)	228.6 ± 48.2	174.8 ± 43.6	<0.001
MPV (fL)	9.4 ± 1.1	10.6 ± 1.3	<0.001
PDW (fL)	14.8 ± 2.1	17.2 ± 2.6	<0.001
PCT (%)	0.21 ± 0.04	0.17 ± 0.04	<0.001
AST (U/L)	34.2 ± 12.6	78.4 ± 38.2	<0.001
Serum creatinine (mg/dL)	0.74 ± 0.16	0.98 ± 0.34	<0.001

Table 3: Correlation of platelet indices with clinical parameters

Platelet index	Systolic BP r (P)	Diastolic BP r (P)	Gestational age r (P)
Platelet count	−0.46 (<0.001)	−0.41 (<0.001)	0.28 (<0.001)
MPV	0.42 (<0.001)	0.37 (<0.001)	−0.24 (0.004)
PDW	0.48 (<0.001)	0.40 (<0.001)	−0.27 (0.001)
PCT	−0.39 (<0.001)	−0.35 (<0.001)	0.22 (0.009)

Table 4: Distribution of participants according to maternal outcomes

Maternal outcome	n	%
Mode of delivery		
Vaginal delivery	42	30.0
Caesarean section	98	70.0
Maternal complications		
Eclampsia	8	5.7
HELLP syndrome	12	8.6
Placental abruption	6	4.3
Acute kidney injury	7	5.0
Pulmonary oedema	4	2.9
Disseminated intravascular coagulation	2	1.4
Postpartum haemorrhage	10	7.1
ICU admission	18	12.9
Maternal mortality	0	0.0
Composite adverse maternal outcome	32	22.9
No recorded adverse maternal outcome	108	77.1
Total participants	140	100.0

Table 5: Association of platelet indices with adverse maternal outcomes

Platelet parameter	Without adverse outcome (n = 108)	With adverse outcome (n = 32)	P value
Platelet count ($\times 10^3/\mu L$)	218.4 ± 47.6	158.6 ± 39.8	<0.001
MPV (fL)	9.6 ± 1.2	11.1 ± 1.4	<0.001
PDW (fL)	15.2 ± 2.3	17.9 ± 2.7	<0.001
PCT (%)	0.20 ± 0.04	0.16 ± 0.04	<0.001

Discussion

In the present study, most participants belonged to the 26–30-year age group, with nearly equal proportions of primigravida and multigravida women. Over half were overweight or obese, and approximately two-thirds had booked pregnancies. Women with severe preeclampsia constituted 44.3% of the study population. The inclusion of different gestational age groups and obstetric backgrounds enabled assessment of platelet indices across varied clinical presentations (Table 1).

Laboratory comparisons revealed significantly lower platelet counts among women with severe features, whereas MPV and PDW were significantly elevated, indicating altered platelet morphology and distribution. These changes may reflect increased platelet activation and consumption due to endothelial injury, followed by the release of larger platelets from bone marrow. Dionisio and Favero reported similar alterations, including reduced platelet counts and PCT with increased MPV and PDW in preeclampsia [8]. Likewise, Tokgöz Çakır et al. observed lower platelet counts and higher PDW in severe preeclampsia, supporting the association between platelet alterations and disease severity [9]. These findings suggest increased platelet turnover with progressive maternal vascular dysfunction (Table 2).

Significant correlations were also observed between platelet indices and clinical parameters. Platelet count and PCT were negatively correlated with systolic and diastolic blood pressure, whereas MPV and PDW showed positive correlations. This suggested that increasing blood pressure was associated with changes in platelet count and morphology. Singh et al. demonstrated increased platelet activation and inflammatory responses in early- and late-onset preeclampsia, with associations between platelet activation and disease severity [10]. Griffin et al. similarly reported elevated MPV and immature platelet fractions among women developing hypertensive disorders of pregnancy [11]. The significant inverse correlation between MPV and gestational age in the present study further indicated an association between platelet alterations and disease presentation. However, these findings did not establish causality (Table 3).

Another important finding was significantly reduced PCT in women with severe preeclampsia. As PCT represents the proportion of blood volume occupied by platelets, its reduction may reflect decreased platelet counts and altered platelet volume. However, evidence regarding its clinical utility remains inconsistent. Sivas et al. found no significant differences in PCT or platelet counts across different groups of hypertensive disorders of pregnancy. They also suggested that normal PCT values could not reliably exclude progression to severe preeclampsia [12]. This difference highlights the importance of interpreting PCT alongside platelet counts and other clinical parameters rather than as an independent severity marker.

Regarding maternal outcomes, caesarean section was the predominant mode of delivery (70%). ICU admission was the most frequent maternal complication, followed by HELLP syndrome and postpartum haemorrhage. Overall, 22.9% of participants experienced at least one adverse maternal outcome, with no maternal mortality. These findings highlighted the clinical burden of preeclampsia and the need for appropriate obstetric monitoring and intervention (Table 4). Andersson et al. demonstrated that haemostatic function varied according to platelet count in women with preeclampsia. Thrombocytopenic women exhibited impaired platelet aggregation and altered coagulation parameters, whereas those with normal platelet counts showed increased platelet aggregation and coagulation activity [13]. These observations further support the relevance of platelet abnormalities in preeclampsia-associated haemostatic disturbances.

Women experiencing adverse maternal outcomes had significantly lower platelet counts and PCT, accompanied by higher MPV and PDW, compared with those without complications. This pattern suggested an association between greater platelet alterations and increased maternal morbidity. The findings were consistent with the role of platelet activation in endothelial injury and thrombo-inflammatory processes. Verma et al. evaluated platelet indices alongside uterine artery Doppler parameters and reported that platelet count and MPV contributed to identifying pregnancies at risk of preeclampsia. Combining haematological and Doppler parameters also improved the identification of early-onset and severe disease [14]. Although their outcomes differed from those examined in the present study, their findings supported the potential role of platelet indices in clinical risk assessment (Table 5).

Overall, platelet indices may provide additional information in the clinical assessment of preeclampsia. Their routine availability through complete blood count testing makes them accessible and inexpensive. However, interpretation should consider gestational age, clinical presentation, platelet count and other laboratory findings. Notably, platelet count below 100,000/µL is itself a criterion for severe preeclampsia. Therefore, its association with disease severity requires cautious interpretation because of potential incorporation bias. Furthermore, the present study demonstrated associations rather than independent predictive effects, as multivariable adjustment for potential confounders was not performed.

The study had certain limitations. Its relatively small sample size and hospital-based design may restrict generalizability. Platelet indices were assessed only at diagnosis, without evaluating serial changes during pregnancy or postpartum. The absence of a normotensive control group also limited comparisons with uncomplicated pregnancies. Larger multicentre studies incorporating serial platelet measurements and adjusted analyses are required to establish the independent clinical significance of individual platelet indices.

Conclusion

The study demonstrated that platelet indices were significantly associated with the severity of preeclampsia and adverse maternal outcomes. Reduced platelet count and plateletcrit, along with increased mean platelet volume and platelet distribution width, were observed in women with severe preeclampsia and those who developed adverse maternal complications. Significant correlations were also observed between platelet indices and blood pressure parameters. These findings suggested that platelet indices could serve as useful, readily available laboratory parameters for assessing disease severity and maternal risk in women with preeclampsia. However, their clinical utility required further validation through larger prospective studies.

References

1. Hennessy A, Ng J, Makris A. The pathophysiology of pre-eclampsia. Nat Rev Nephrol. 2026;22(9):622-634. doi: 10.1038/s41581-026-01085-x.
2. Woldeamanuel GG, Tlaye KG, Wu L, Poon LC, Wang CC. Platelet count in preeclampsia: a systematic review and meta-analysis. Am J Obstet Gynecol MFM. 2023;5(7):100979. doi: 10.1016/j.ajogmf.2023.100979.
3. Udeh PI, Olumodeji AM, Kuye-Kuku TO, Orekoya OO, Ayanbode O, Fabamwo AO. Evaluating mean platelet volume and platelet distribution width as predictors of early-onset pre-eclampsia: a prospective cohort study. Matern Health Neonatol Perinatol. 2024;10:5. https://doi.org/10.1186/s40748-024-00174-8
4. Thakkar D, Shihora J, Gandhi R, Parmar R, Yogesh M. Predictive value of platelet parameters for early-onset pre-eclampsia: A prospective cohort study in a teaching institution in Gujarat, India. J Family Med Prim Care. 2025;14(1):327-333. doi: 10.4103/jfmpc.jfmpc_1331_24.
5. Agarwal M, Singh S, Bhushan D, Ahmad S, Sinha R, Sinha S. Role of platelet-related parameters in prediction of development and severity of preeclampsia (PE): an observational prospective cohort study. SAGE Open Med. 2025;13:20503121251390611. doi: 10.1177/20503121251390611.
6. Rashmi SS, Patnaik M, Singh S, Pattnaik L, Mohanty M. Diagnostic and prognostic role of platelet indices in pre-eclampsia: Insights from a hospital-based study in Eastern part of India.

J Educ Health Promot. 2026;15:161. doi: 10.4103/jehp.jehp_835_25.
7. Gestational Hypertension and Preeclampsia: ACOG Practice Bulletin, Number 222. Obstet Gynecol. 2020;135(6):e237-e260. doi: 10.1097/AOG.0000000000003891.
8. Dionisio LM, Favero GM. Platelet indices and angiogenesis markers in hypertensive disorders of pregnancy. Int J Lab Hematol. 2024;46(2):259-265. doi: 10.1111/ijlh.14202.
9. Tokgöz Çakır B, Aktemur G, Karabay G, Şeyhanlı Z, Çetin S, Filiz AA, et al. Evaluation of Platelet Indices and Inflammation Markers in Preeclampsia. J Clin Med. 2025;14(5):1406. doi: 10.3390/jcm14051406.
10. Singh K, Lia M, Prakasan Sheeja A, Federbusch M, Gupta A, Elwakiel A, et al. Increased platelet activation and thrombo-inflammation in early and late-onset preeclampsia. Res Pract Thromb Haemost. 2025 Jun 24;9(5):102956. doi: 10.1016/j.rpth.2025.102956.
11. Griffin MM, Penfield CA, Hausvater A, Schaap A, Roman AS, Xia Y, et al. The relationship between platelet indices and hypertensive disorders of pregnancy. Eur J Obstet Gynecol Reprod Biol. 2025;308:234-239. doi: 10.1016/j.ejogrb.2025.03.014.
12. Sivas MC, Aslancan R, Bayram TY. Relationship between hypertensive disease stages of pregnancy and plateletcrit values: A retrospective cohort study. Heliyon. 2024;10(22):e39991. doi: 10.1016/j.heliyon.2024.e39991.
13. Andersson M, Bengtsson P, Karlsson O, Thörn SE, Thorgeirsdottir L, Bergman L, et al. Platelet aggregation and thromboelastometry monitoring in women with preeclampsia: a prospective observational study. Int J Obstet Anesth. 2025;61:104297. doi: 10.1016/j.ijoa.2024.104297.
14. Verma S, Singh S, Bhasker N, Jain M, Sahu S, Singh H, Verma N. Linking platelet indices and uterine artery Doppler parameters for preeclampsia prediction and its severity. Bioinformation. 2024;20(12):1829-1833. doi: 10.6026/9732063002001829.