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Original Research Article

A cross-sectional observational study of coagulation profile and platelet parameters in pregnancy induced hypertension cases

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ABSTRACT

Background: Pregnancy-induced hypertension (PIH) is associated with significant alterations in coagulation profile and platelet parameters. Early detection of these changes can help predict complications such as preeclampsia, eclampsia, and HELLP syndrome. This study aimed to evaluate coagulation and platelet parameters in PIH and assess their correlation with disease severity.
Methods: This observational study was conducted in the department of obstetrics and gynecology after institutional review board approval and informed consent. A total of 100 patients with PIH were included between December 2023 and November 2024. Coagulation parameters (PT, aPTT) and platelet indices (platelet count, MPV, PDW) were measured and compared according to disease severity.
Results: The mean age of participants was 28.4 years (19-40 years), with 65% aged 25-35 years. The mean gestational age was 31.2 weeks, and most cases were diagnosed between 28-34 weeks. Primigravida women constituted 72% of the cohort. Elevated PT and aPTT levels indicated endothelial dysfunction and impaired coagulation, correlating with complications such as preeclampsia, eclampsia, and HELLP syndrome. A significant decrease in platelet count was observed, particularly in severe PIH cases. Mean Platel
Conclusions: Coagulation and platelet abnormalities correlate with PIH severity and can serve as early indicators of disease progression. Routine assessment of these parameters may aid in early detection, risk stratification, and improved management, thereby reducing maternal and fetal morbidity and mortality.

Keywords: Coagulation profile, MPV, Platelet parameters, Preeclampsia, Pregnancy-induced hypertension, Thrombocytopenia

INTRODUCTION

Pregnancy-induced hypertension (PIH) is defined as new-onset hypertension occurring after 20 weeks of gestation in previously normotensive women.[1] Although it typically resolves postpartum, PIH remains a major obstetric complication associated with significant maternal and fetal morbidity and mortality.[2] It encompasses a spectrum of disorders ranging from gestational hypertension to preeclampsia, eclampsia, and HELLP syndrome, reflecting increasing severity and systemic involvement.[3]

Hypertensive disorders of pregnancy are among the leading causes of maternal and perinatal mortality worldwide, particularly in low- and middle-income countries.[4] PIH contributes to adverse fetal outcomes such as placental insufficiency, intrauterine growth restriction, preterm birth, and stillbirth.[5] These outcomes are often worsened by inadequate antenatal care and delayed diagnosis in resource-limited settings.[6]

The pathophysiology of PIH is multifactorial. Abnormal placentation and impaired uteroplacental perfusion lead to

endothelial dysfunction, increased vascular resistance, and activation of inflammatory and oxidative stress pathways.[7] These mechanisms result in widespread endothelial injury, altered coagulation, and increased platelet activation, especially in severe disease.[8]

Several risk factors are associated with PIH, including primigravidity, advanced maternal age, obesity, multiple gestations, preexisting conditions such as diabetes mellitus and renal disease, and a family history of hypertensive disorders.[9] Diagnosis is based on blood pressure ≥140/90 mmHg after 20 weeks of gestation, with progression to preeclampsia marked by multisystem involvement.[10]

Emerging evidence suggests that PIH has long-term implications, increasing the risk of chronic hypertension and cardiovascular disease in later life, while offspring may also have increased cardiometabolic risk.[11] Early identification and monitoring of hematological and coagulation parameters may aid in predicting disease severity and improving outcomes.[12]

Aim

To assess the coagulation factor and platelet parameters in pregnancy-induced hypertension.

Objectives

Primary objective

To measure the coagulation profile and platelet parameter in antenatal women after 20 weeks of gestation.

Secondary objective

To assess the correlation between coagulation profile and parameter level in antenatal women after 20 weeks of gestation.

METHODS

Sample size and sampling method

The sample size comprised all patients attending the Gopinath Maternity Home at Sir T. Hospital who fulfilled the inclusion criteria. Data were collected from patients visiting the antenatal outpatient department on Tuesdays and Fridays. A total of 100 patients were included in the study, and the sampling method employed was random selection.

Study type

It was a cross-sectional observational study.

Study site

The study was carried out at Gopinath Maternity Home, Sir T. Hospital, a tertiary care hospital in Bhavnagar Gujrat (December 2023 to November 2024).

Inclusion criteria

Antenatal cases who were beyond 20 weeks of gestation having blood pressure more than 140/90 mmHg taking 4 hours apart.

Exclusion criteria

All antenatal pregnancy induced hypertensive patients with family history of hemoglobinopathy or blood transfusion and having comorbidity like diabetes and having chronic hypertension and also excluding medical illness like dengue, malaria, hepatitis which affect coagulation profile and platelets level.

Investigation measures

The parameters assessed in the study included blood pressure and various coagulation and hematological indices. Prothrombin time and international normalized ratio (PT/INR) were measured to evaluate the extrinsic pathway of coagulation, while activated partial thromboplastin time (APTT) assessed the intrinsic pathway. Bleeding time (BT) and clotting time (CT) were recorded to determine overall hemostatic function. In addition, platelet count along with platelet parameters was analyzed to assess platelet status and function

Statistical methods

The data collected during the study was cleaned and entered into Microsoft Excel for analysis. Continuous variables were expressed as mean±standard deviation (SD), while categorical variables were represented as percentages. To determine the significance of correlations, the Chi-square test was employed. Key outcomes, including mode of delivery and neonatal results, were assessed using this statistical approach.

A p value of ≤0.05 was considered statistically significant in determining the relevance of the findings to the study's objectives.

RESULTS

The mean age was 28.4±5.6 years, with most women in the third trimester (31.2±2.5 weeks). A majority (72%) were primiparous, indicating higher occurrence of PIH in first pregnancies (Table 1).

Table 1: Demographic and baseline characteristics of participants.

Variables	Mean (SD)	Range	N (%)
Age (years)	28.4 (5.6)	19-40	-
Gestational age (weeks)	31.2 (2.5)	28-36	-
Parity	-	-	-
Primiparous	-	-	72 (72)

Coagulation parameters (PT, aPTT, INR, BT, CT) were mildly prolonged in PIH patients, suggesting altered coagulation status (Table 2).

Table 2: Coagulation profiles in PIH.

Coagulation profile	Mean (SD)
PT (s)	14.5 (1.3)
aPTT (s)	37.6 (3.4)
INR	1.12 (0.08)
BT (minutes)	3.06 (0.57)
CT (minutes)	4.91 (0.54)

Table 3: Platelet parameters in PIH cases.

Platelet parameter	Mean (SD)
Platelet count (10^3/µl)	130.5 (20.3)
MPV (fl)	10.2 (0.8)
PDW (%)	15.4 (1.1)

Platelet count was reduced, while MPV and PDW were increased, indicating thrombocytopenia with enhanced platelet activation in PIH.

Table 4: Prothrombin time (PT), INR, and aPTT in PIH versus normotensive controls.

Parameters	PIH Cases (M±SD)	Controls (M±SD)	P value
PT (s)	14.5 (1.3)	12.3 (1.0)	<0.001
INR	1.12 (0.08)	1.01 (0.05)	<0.01
aPTT (s)	37.6 (3.4)	30.1 (2.9)	<0.001

PT, INR, and aPTT were significantly higher in PIH cases compared to controls ($p<0.01$), showing statistically significant coagulation derangement.

Table 5: Platelet count, mean platelet volume (MPV), and platelet distribution width (PDW) in PIH cases versus controls.

Parameters	PIH Cases (M±SD)	Controls (M±SD)	P value
Platelet count (10^3/µl)	130.5 (20.3)	210.4 (15.2)	<0.001
MPV (fl)	10.2 (0.8)	8.6 (0.6)	<0.001
PDW (%)	15.4 (1.1)	12.8 (0.9)	<0.001

Table 6: Coagulation markers by severity levels of PIH.

PIH severity	PT (s)	aPTT (s)	INR
Mild	13.4	34.2	1.05
Moderate	14.5	37.5	1.12
Severe	15.2	39.8	1.20

Platelet count was significantly lower in PIH cases compared to controls, while MPV and PDW were significantly higher ($p<0.001$). This indicates thrombocytopenia with increased platelet activation in PIH.

Coagulation parameters (PT, aPTT, INR) progressively increased with severity of PIH, showing worsening coagulation derangement from mild to severe disease.

Table 7: Platelet parameters across mild, moderate, and severe PIH.

PIH severity	Platelet count (10^3/µl)	MPV (fl)	PDW (%)
Mild	150.6	9.6	14.3
Moderate	130.5	10.2	15.1
Severe	115.8	10.8	16.0

Platelet count decreased with increasing severity of PIH, whereas MPV and PDW showed a rising trend, reflecting increased platelet activation in severe cases.

Table 8: Correlation matrix of coagulation and platelet parameters with PIH severity.

Parameters	PIH severity (r)	P value
Platelet count	0.69	<0.001
MPV	0.62	<0.001
PDW	0.55	<0.001

Significant correlations were observed between PIH severity and platelet as well as coagulation parameters ($p<0.001$), indicating that these markers are strongly associated with disease severity.

Table 9: Across mild, moderate, and severe conditions.

Condition	Bleeding time (in minutes)
Mild	3.01
Moderate	3.09
Severe	3.12

Bleeding time showed a slight increasing trend with severity of PIH, rising from mild to severe cases, indicating progressive impairment in primary hemostasis.

Table 10: Clotting time across mild, moderate, and severe conditions.

Condition	Clotting time (in minutes)
Mild	4.3
Moderate	4.9
Severe	5.05

Clotting time increased with the severity of PIH, with highest values in severe cases, suggesting worsening coagulation dysfunction as disease progresses.

DISCUSSION

This study evaluated coagulation profiles and platelet parameters in patients with pregnancy-induced hypertension (PIH) and their association with disease severity. The findings demonstrate significant alterations in both coagulation and platelet indices, particularly in severe PIH, highlighting their potential role as markers of disease progression and adverse outcomes.

Patients with PIH, especially those with severe disease, showed significantly prolonged prothrombin time (PT) and activated partial thromboplastin time (aPTT) compared to normotensive controls. These abnormalities suggest impaired coagulation function and may contribute to an increased risk of hemorrhagic complications such as placental abruption and postpartum hemorrhage. Similar findings have been reported in earlier and recent studies on coagulation abnormalities in preeclampsia supporting the consistent presence of coagulation dysfunction in PIH.[8,11-13] These changes likely reflect underlying endothelial damage and altered hemostatic balance.[5,7,14]

Significant platelet abnormalities were also observed. PIH patients demonstrated reduced platelet counts, particularly in severe cases, along with increased mean platelet volume (MPV) and platelet distribution width (PDW). Thrombocytopenia may result from increased platelet consumption due to endothelial injury, microvascular thrombosis, and enhanced platelet aggregation. Elevated MPV and PDW indicate increased platelet activation and turnover, consistent with previous and recent studies.[8,12,15,16]

A key observation was the strong correlation between coagulation markers (PT, aPTT) and platelet indices (platelet count, MPV, PDW) with disease severity. Severe PIH was associated with prolonged coagulation times, lower platelet counts, and increased platelet activation markers, reflecting a complex state of simultaneous hypercoagulability and bleeding tendency, as also supported in contemporary literature.[11,13,17]

Clinically, these findings support incorporating coagulation and platelet parameters into routine PIH assessment for early detection of complications and risk stratification, as emphasized in established guidelines.[1,2,18] Early identification may help predict adverse outcomes such as preeclampsia, eclampsia, and HELLP syndrome, enabling timely intervention.

However, limitations such as cross-sectional design, single-center setting, and small sample size warrant further large-scale longitudinal studies to validate these findings and explore therapeutic implications.

CONCLUSION

This study demonstrated significant coagulation and platelet abnormalities in pregnancy-induced hypertension, particularly in severe cases. Prolonged PT and aPTT with reduced platelet count and elevated MPV and PDW correlate with disease severity, supporting their use as early markers to guide clinical monitoring and improve maternal and neonatal outcomes.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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