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Study of coagulation profile and platelet count in pregnancy induced hypertension, preeclamptic and eclamptic patients

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Abstract
Introduction: Hypertensive disorders in pregnancy is one of the major causes of maternal & perinatal morbidity and mortality. Pregnancy induced hypertention (PIH) is defined as hypertension that develops as the direct result of the gravid state. Profound changes in coagulation and fibrinolytic system occur during normal pregnancy causing hypercoagulable state. Preeclampsia and eclampsia is a highly thrombotic and pro-coagulant state with platelet activation and thrombin and fibrin formation.
Methodology: A prospective study carried out in department of pathology B. J. medical college during March 2021 to August 2021. Coagulation profile (PT, aPTT, and D-dimer) and platelet count was done in cases and values were correlated with the severity of PIH.
Results: Total of 100 cases were included in the study. 26 were mild gestational hypertension, 13 cases were severe gestational hypertension, 36 cases were mild pre-eclampsia and 14 cases were in severe pre-eclampsia group and 11 patients in eclampsia group. Prolonged PT, aPTT, D-Dimer and thrombocytopenia was seen in 9 cases, 29 cases, 32 cases and 17 cases respectively. In our study we observed increased aPTT, D-dimer and thrombocytopenia in severe pre-eclampsia and eclampsia patients.
Conclusion: Estimation of the coagulation parameters and platelet count play an important role in the evaluation of risk factors, early detection, and effective antenatal services. Which can help to reduce the maternal and fetal morbidity and mortality associated with pregnancy induced hypertension.

Keywords: preeclampsia, eclampsia, hypercoagulable state

Introduction

Hypertensive disorders in pregnancy is one of the commonest medical disorders in pregnancy diagnosed by obstetricians in clinical practice and is one of the major causes of maternal & perinatal morbidity and mortality [1].

Hypertensive disorders complicates 5 to 10% of all pregnancies [2]. It is associated with 16% of all maternal mortality and 20% of all perinatal mortality in India [3]. Due to low socioeconomic status, apathetic attitude, poor health education and lack of regular antenatal supervision, the incidence of preeclampsia is more in developing countries like India [4].

Pregnancy induced hypertention (PIH) is defined as hypertension that develops as the direct result of the gravid state. It includes, i) Gestational hypertension, ii) Preeclampsia, iii) Eclampsia [5].

In pregnancies with preeclampsia coagulation cascade is generally activated. Preeclampsia is a highly thrombotic and pro-coagulant state with platelet activation and thrombin and fibrin formation. About 20% of patients have altered coagulation profile in PIH patients [6].

The etiology of eclampsia typically consist of the sudden onset of convulsions in women nearing delivery with approximately one third ending in maternal death or fetal death in utero [7].

Women with pregnancy induced hypertension may develop a variety of haematological aberrations. Out of all the haematological changes that occur in hypertensive disorders, thrombocytopenia is the most common haematological abnormality found [8].

Profound changes in coagulation and fibrinolytic system occur during normal pregnancy causing hypercoagulable state. The prothrombotic state may cause chronic disseminated intravascular coagulation (DIC) leading to changes in kidney and placenta [9].

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It is known that an underlying coagulation abnormality increases the risk of bleeding complications. Thus, we have to use correct and necessary laboratory tests for early diagnosis and prevent complications of hypertensive disorders of pregnancy. Hence, the study results may help in early identification of such high risk patients and better management of pregnancy induced hypertension.

Aims and Objective
▪ This study was to find out the changes that occur in the coagulation profile and platelet indices in Pregnancy induced hypertension.
▪ The study was done to see if coagulation profile and platelet count can be used as a reliable indicator of the onset and severity of Pre-eclampsia and eclampsia.

Methodology
A analytical prospective study carried out in department of pathology B. J. medical college Ahmedabad. 100 patients were included in the study group. These patients were diagnosed with Gestational hypertension, pre eclampsia and eclampsia by Department of Obstetrics And Gynecology, Civil Hospital, Ahmedabad during March 2021 to August 2021.

After obtaining consent, under aseptic precaution, venous blood was collected in Sodium citrate vacutainer and EDTA vacutainer. Samples were tested for coagulation profile i.e. PT, aPTT, D-Dimer in fully automated coagulation analyser (CA-1500) and Platelet count in HORIBA Penta-XLR.

Statistical Methods: Analysis of variance (ANOVA), Chi-square/ Fisher Exact test has been used.

Inclusion criteria
▪ **Gestational Hypertension:** Systolic BP≥140 mmHg or diastolic BP≥90 mmHg for first time after 20 week of pregnancy without proteinuria and BP returned to normal before 12 weeks post-partum.
▪ **Mild Gestational Hypertension:** Systolic blood pressure between 140-160 mm Hg Diastolic blood pressure between 90-110 mm Hg,
▪ **Severe Gestational Hypertension:** Systolic blood pressure>160 mm Hg, Diastolic blood pressure >110 mm Hg
  Elevation of transaminase AST or ALT, fetal growth restriction and pulmonary edema
▪ **Pre-eclampsia**
▪ **Mild/Non-Severe Pre-eclampsia:** Systolic blood pressure between 140-160 mm Hg Diastolic blood pressure between 90-110 mm Hg, Proteinuria 1+.

▪ **Severe Pre-eclampsia:** Systolic blood pressure>160 mm Hg, Diastolic blood pressure >110 mm Hg, plus one or more of the following criteria: proteinuria ≥1+, headache, visual disturbances, upper abdominal pain, oliguria (<400 ml/24 hours), serum creatinine elevated >1.2 mg/dl, thrombocytopenia (platelet<100,000/mm3) marked elevation of serum
• **Eclampsia:** In a woman with preeclampsia, a convulsion that cannot be attributed to another cause [10].

Exclusion criteria
Patients with Pre-existing medical disorders like Diabetes Mellitus, Renal disease, Any coagulopathies, Chronic Hypertension, Smokers, Multi fetal Gestation, Placental abruption or previa, Sepsis, Heavy vaginal bleeding, ITP, HELLP syndrome.

Results
One hundred cases diagnosed as PIH were analysed for coagulation profile. Of 100 cases 42% of the patients were of the age group 25-30 years. (Pie chart) The age of the youngest patient was 20 years and that of oldest was 40 years.
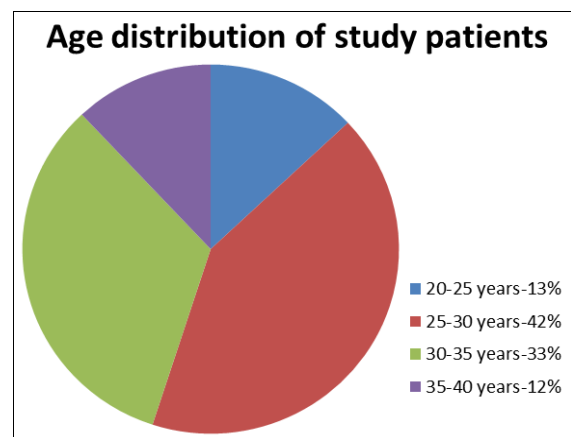
Fig 1: Age distribution of study patients

Table 1. showing, 25 to 30 years is the commonest age group for gestational hypertension (GH), both mild GH (9 cases) and severe GH (7cases). Mild pre-eclampsia was also more frequent in the 25 to 30 age group (15 cases). Severe pre-eclampsia was common in 30-35 years age group (7 cases).

Table 1: Age wise distribution of various categories of PIH cases

Age (in years)	Mild GH		Severe GH		Mild Preeclampsia		Severe Pre Eclampsia		Eclampsia	
	No.	%	No.	%	No.	%	No.	%	No.	%
20-25	2	7.8%	2	15.4%	6	16.7%	1	7.14%	2	18.2%
25-30	9	34.6%	7	46.7%	15	41.7%	5	35.8%	6	54.5%
30-35	10	38.5%	3	23.1%	11	30.5%	7	50%	2	18.2%
35-40	5	19.2%	1	7.7%	4	11.1%	1	7.1%	1	9.1%
Total	26	100%	13	100%	36	100%	14	100%	11	100%

Table-2 shows, Prolonged PT was seen in total 9 of cases in this study, 3 (18.6%) cases of mild preeclampsia, 1 (7.1%) case of severe preeclampsia and 2 (18.2%) cases of eclampsia. Significant raise in PT was not seen in severe pre-eclampsia and eclampsia. (P – Value: 0.983)

Reduced platelets was seen in total 17 of cases in this study,4 (11.1%) cases of mild preeclampsia, 3 (21.4%) cases of severe preeclampsia and 5 (45.4%) cases of eclampsia. Significant reduction in platelet count was seen in eclampsia. (P – Value: 0.847)

Table 2: Abnormal coagulation parameters in different categories of PIH

Abnormal Test	Prolonged PT	Prolonged APTT	Reduced Platelets	Increased D-dimer
Mild GH	1 (3.8%)	3 (11.5%)	2 (7.6%)	2 (7.6%)
Severe GH	2 (15.3%)	2 (15.3%)	3 (23.1%)	2 (15.3%)
Mild preeclampsia	3 (18.6%)	11 (30.5%)	4 (11.1%)	13 (36.1%)
Severe preeclampsia	1 (7.1%)	6 (42.8%)	3 (21.4%)	7 (50%)
Eclampsia	2 (18.2%)	7 (63.6%)	5 (45.4%)	8 (72.7%)
Total	9	29	17	32

Prolonged aPPT was seen in total 29 cases of this study, among them 03 cases (11.5%) of mild GH, 02 cases (15.3%) of severe GH, 11 cases (30.5%) mild preeclampsia, 6 cases (42.8%) of severe preeclampsia and 7 cases (63.6%) of eclampsia. Significant raise in aPTT was seen in severe pre-eclampsia and eclampsia. (P – Value: 0.263)(Fig. 1).
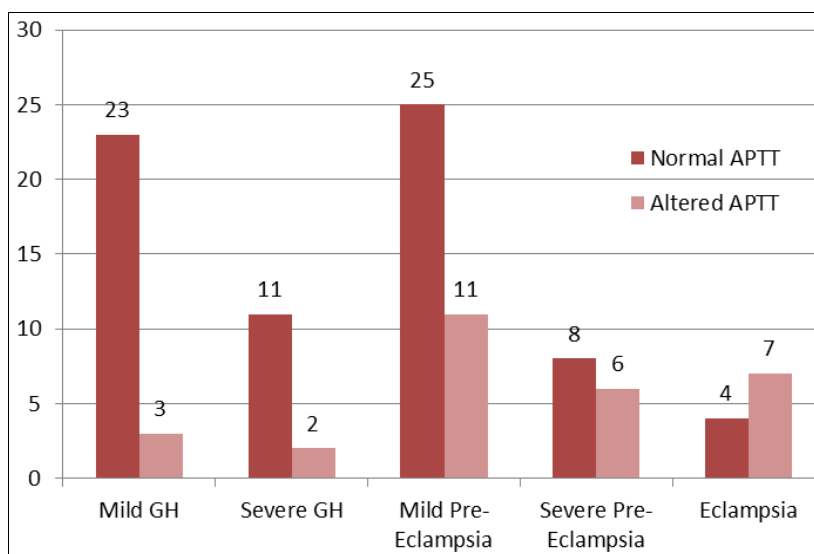
Fig 1: Bar Chart Showing aPTT in Different Grades of PIH

Prolonged D-dimer was seen in total 32 cases of this study, among them 02 cases (7.6%) of mild GH, 02 cases (15.3%) of severe GH, 13 cases (36.1%) of mild preeclampsia and 7 cases (50%) of severe preeclampsia and 8 cases (72.7%) of eclampsia. Significant raise in D-dimer was seen in severe pre-eclampsia and eclampsia. (P – Value: 0.452)(Fig. 2)
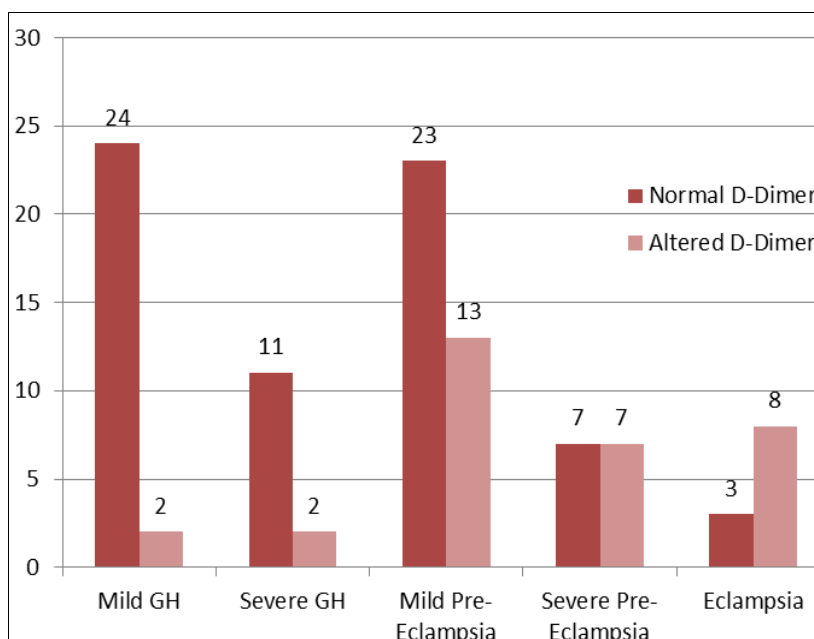
Fig 2: Bar Chart Showing D-Dimer in Different Grades of PIH

Table.3 shows value of aPTT increases with severity of PIH with maximum value in eclampsia (33.64±2.57); D dimers were in higher range in eclampsia and severe preeclampsia (31.34±2.79 and 33.64 ± 2.57 respectively) as compared to others.

So, APTT and D dimer (significant P value 0.263 and 0.452 respectively) can predict the severity of PIH and helps us to plan and manage patient accordingly.

Table 3: Comparison of coagulation profile in different categories of PIH

Variable	Mild GH	Severe GH	Mild preeclampsia	Severe preeclampsia	eclampsia	p-value
Age (years)	26.4±3.15	27.6±2.23	26.8±2.63	27.4±3.58	28.3±2.54	0.993
PT	11.72±1.78	12.37±1.62	13.43±2.17	13.25±2.31	12.42±1.85	0.983
APTT	27.43±2.54	28.12±3.04	28.92±3.26	31.34±2.79	33.64±2.57	0.263
Platelet count	2.64±0.57	2.43±0.36	1.85±0.64	1.73±0.76	1.26±0.64	0.847
D-dimer	0.31±0.62	0.37±0.24	0.32±0.26	0.43±0.35	0.53±0.28	0.452

Discussion

Preeclampsia is an idiopathic multisystem disorder specific to human pregnancy and the puerperium [5]. Hematological abnormalities such as thrombocytopenia and decrease in some plasma clotting factors may develop in preeclamptic women. Subtle changes suggesting disseminated intravascular coagulation (DIC) is one of the serious outcome of preeclampsia. Thus, coagulation testing is to be done in these patients to rule out DIC and HELLP (hemolysis, enzyme elevation and low platelet) syndrome [6, 7].

It was observed that abnormal PT, aPTT and fibrinogen levels with platelet counts of less than 100,000/mm3 were seen in preeclampsia. So the physician can safely follow this laboratory tests in patients with severe preeclampsia and eclampsia [8].

Table 4 Shows comparision of present study with other studies.

Table 4: Comparision of different studies

Parameters(abnormal value percentage)	Present study	Kumar P. et. al. [11]	Chaware S A [12]
Most common Age group	25-30 years	26-30 years	20-24 years
PT	9%	15%	1.6%
APTT	29%	42%	12.5%
D-dimer	32%	38%	-
Platelets count	17%	-	10%

In our study a total of 100 PIH cases referred to the department of pathology from ANC clinic were evaluated for coagulation profile. Majority of the cases were in the age group of 25-30 years with mean of 27±3.02, which is comparable to Kumar P. et. (26-30 years) and Chaware S AV (20-24 years) studies.

In the present study PT was prolonged in 9% cases which is in concordance with the study conducted by Kumar P. et. Al in which (15%) and results differ from Chaware S A study.

Results of aPTT was prolonged in 29% of PIH cases in our study which is compared with Kumar P. et. (42%) and Chaware S A V (12.5%) study.

In the present study D-Dimer levels increased in 32% of PIH cases which is in concordance with the Kumar P. *et al.* (38%) study.

Platelets count reduced in 17% PIH cases which is concordance with Chaware S A (10%) study results [11, 12].

Prolonged PT, aPTT, D-Dimer and reduced platelet count was seen in 9 cases, 29 cases, 32 and 17 cases respectively in our study.

Significant increased mean aPTT and D-dimer in severe preeclampsia and eclampsia patients was noted. Hence we emphasize that raised aPTT and D-Dimer are alarming signs for aggressive treatment.

Conclusion

Study of Coagulation profile showed coagulation abnormalities in preeclampsia and eclampsia patients have significantly higher Activated Partial Thromboplastin Time and D-dimer compared to other group.

From the study of platelet count, it may be concluded that decrease in platelet count starts from PIH and it is significantly reduced in preeclampsia and eclampsia patients. Eclamptic patients having thrombocytopenia (platelet count <150000/cmm).

Estimates of the coagulation parameters and platelet count play an important role in the evaluation of risk factors, early detection, and effective antenatal services**.** These are routine tests which can be performed and it can help to reduce the maternal and fetal morbidity and mortality associated with pregnancy induced hypertension.

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