

## STUDY OF COAGULATION PROFILE IN PREGNANCY INDUCED HYPERTENSION (PIH)

Nirmala T<sup>1</sup>, Kumar Pradeep L.<sup>2,\*</sup>, Vani B R.<sup>3</sup>, Murthy Srinivasa V.<sup>4</sup>, Geetha R L<sup>5</sup>

<sup>1</sup>Junior Resident/PG Student, <sup>3</sup>Associate Professor, <sup>4</sup>Professor & HOD, <sup>5</sup>Assistant Professor, Department of Pathology, ESICMCPGIMSR, Rajajinagar, Bangalore.

<sup>2</sup>Assistant Professor, Dept. of Pathology, Gadag Institute of Medical Sciences

**\*Corresponding Author:**

Email: pradeepnaik.l@gmail.com

---

### ABSTRACT

**Background:** Hypertension is one of the common medical complications of pregnancy and contributes significantly to maternal and perinatal morbidity and mortality. Hypertension is a sign of an underlying pathology which may be pre-existing or appear for the first time during pregnancy. Various haematological changes like numerical and functional platelet abnormalities, alteration in haemoglobin and erythrocyte parameters and hypercoagulable state may be seen.

**Aims and Objectives:** Evaluation of coagulation profile in PIH.

**Materials and Methods:** A 2 year study was carried out in the Dept. of pathology ESIMCPGIMSR, Bangalore on 100 PIH cases. Coagulation profile (PT, aPTT, INR and D-dimer) was done in all cases and values were correlated with the severity of PIH.

**Results:** Total of 100 cases were included in the study. 37 were mild GH, 9 cases were severe GH, 29 cases were mild preeclampsia and 25 cases were in severe preeclampsia group. Prolonged PT, aPTT and D-Dimer was seen in 15 cases, 42 cases and 38 cases respectively. In our study we observed increased mean aPTT of 27.33±4.54 and increased D-Dimer of 0.35±0.33 in severe preeclampsia patients. Hence we emphasize that raised aPTT, D-Dimer are alarming signs for aggressive treatment.

**Conclusion:** Raised aPTT and D-dimer are fairly good indicator of severe preeclampsia and needs aggressive treatment.

**Key Words:** Hypertension, preeclampsia, eclampsia, HELLP Syndrome, D-Dimer.

---

### INTRODUCTION

Hypertension is one of the most common medical complications of pregnancy. It contributes significantly to maternal and perinatal morbidity and mortality. Hypertension is a sign of an underlying pathology which may be pre-existing or appear for the first time during pregnancy.<sup>[1]</sup> Hypertension affects 7-15% of all pregnancies. It is associated with 16 % of all maternal mortality and 20% of all perinatal mortality in India.<sup>[1,2]</sup>

Pregnancy induced hypertension (PIH) is defined as hypertension that develops as the direct result of the gravid state. It includes, i) Gestational hypertension, ii) Preeclampsia, iii) Eclampsia.<sup>[1,2]</sup>

Hematological abnormalities such as thrombocytopenia and decrease in some plasma clotting factors may develop in preeclamptic women.<sup>[3]</sup>

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.<sup>[4]</sup>

**AIMS AND OBJECTIVES:** Evaluation of coagulation profile in PIH.

### MATERIALS AND METHODS

The study was carried out in the department of Pathology, ESIC-MC PGIMSR, Rajajinagar, and Bangalore from October-2011 to September-2013. One hundred cases diagnosed as PIH with Blood Pressure of  $\geq 140/90$  mm of Hg detected after 20<sup>th</sup> weeks of gestation were included in the study. Clinical details were collected from all cases. The cases with pre-existing hypertension and associated co morbid diseases such as diabetes mellitus, auto immune disorders, ITP, neoplastic diseases,

heart diseases and cases on anti-coagulants were excluded from the study.

After obtaining consent, under aseptic precaution, venous blood was collected in Sodium citrate vacutainer tube. Sample was tested for coagulation profile i.e. PT, aPTT, D-Dimer in fully automated coagulation analyser (CA-1500).

PIH cases were classified in to following categories:-

- A. Gestational hypertension. 1) Mild gestational hypertension, 2) Severe gestational hypertension.
- B. Preeclampsia. 1) Mild preeclampsia, 2) Severe preeclampsia.

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

**Statistical software:** The Statistical software namely SAS 9.2, SPSS 15.0 were used.

## RESULTS

One hundred cases diagnosed as PIH were analysed for coagulation profile. Of 100 cases majority i.e. 45% of the patients were of the age group 26-30 years. (Table. 1) The age of the youngest patient was 19 years and that of oldest was 35 years. 21 to 25 years is the commonest age group for gestational hypertension (G H), both mild (16cases) and severe (4cases). An equal number of severe G H was also seen in the 26 to 30 age group. Mild and severe pre-eclampsia was more frequent in the 26 to 30 age group, (16 and 11 cases respectively). This probably indicates that severity of complications increases with the age of the patient. (Table. 2) Of the hundred PIH cases, Sixty one cases (61%) were primigravida and remaining Thirty nine cases (39%) were of multi gravida.

**Table 1: Age wise distribution of cases.**

Age in years	Number of patients	%
16-20	07	07.0
21-25	39	39.0
<b>26-30</b>	<b>45</b>	<b>45.0</b>
31-35	9	9.0
Total	100	100.0

**Table 2: Table showing age wise distribution of various categories of PIH cases**

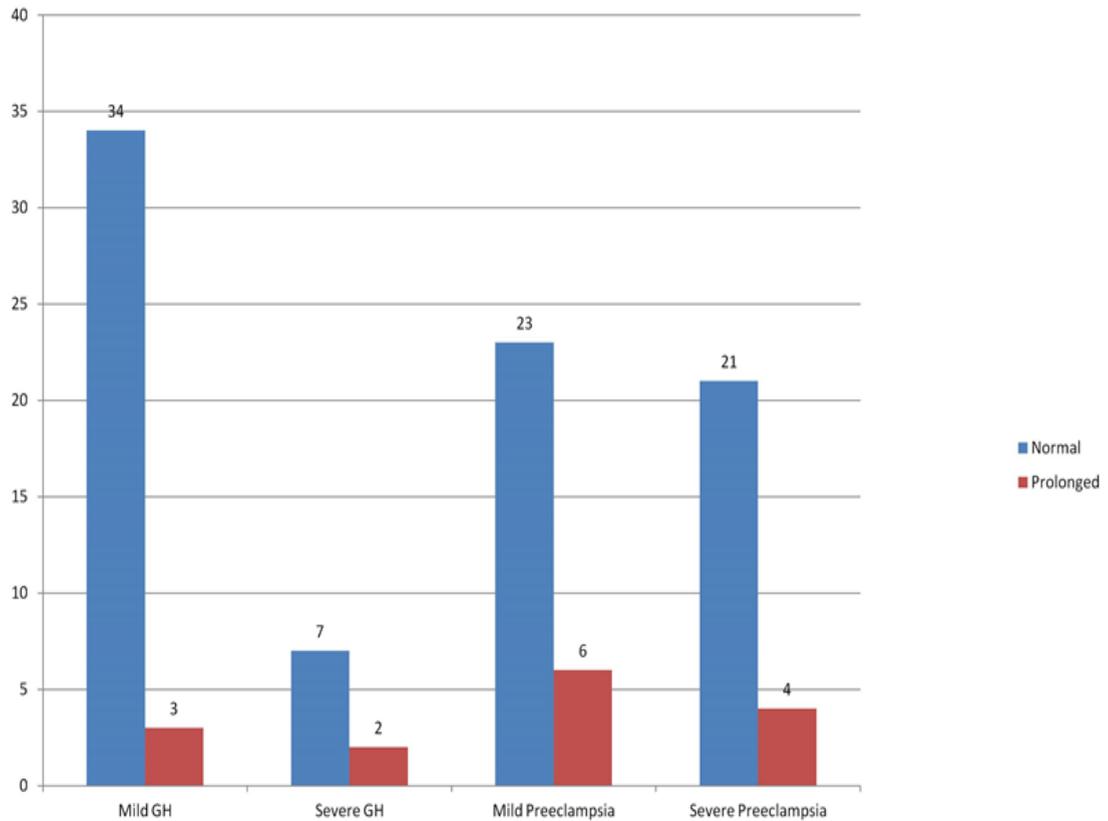
Age in years	Mild GH (n=37)		Severe GH (n=9)		Mild Preeclampsia (n=29)		Severe Preeclampsia (n=25)	
	No	%	No	%	No	%	No	%
16-20	2	5.5	-	-	2	6.8	3	12
<b>21-25</b>	<b>16</b>	<b>43.2</b>	<b>4</b>	<b>44.4</b>	10	34.5	<b>9</b>	<b>36</b>
26-30	14	37.8	4	44.4	<b>16</b>	<b>55.3</b>	<b>11</b>	<b>44.0</b>
31-35	5	13.5	1	12.2	1	3.4	2	8.0
Total	37	100.0	9	100.0	29	100.0	25	100.0

In the present study both GH and mild preeclampsia cases were asymptomatic whereas 9% of the cases with severe preeclampsia had headache followed

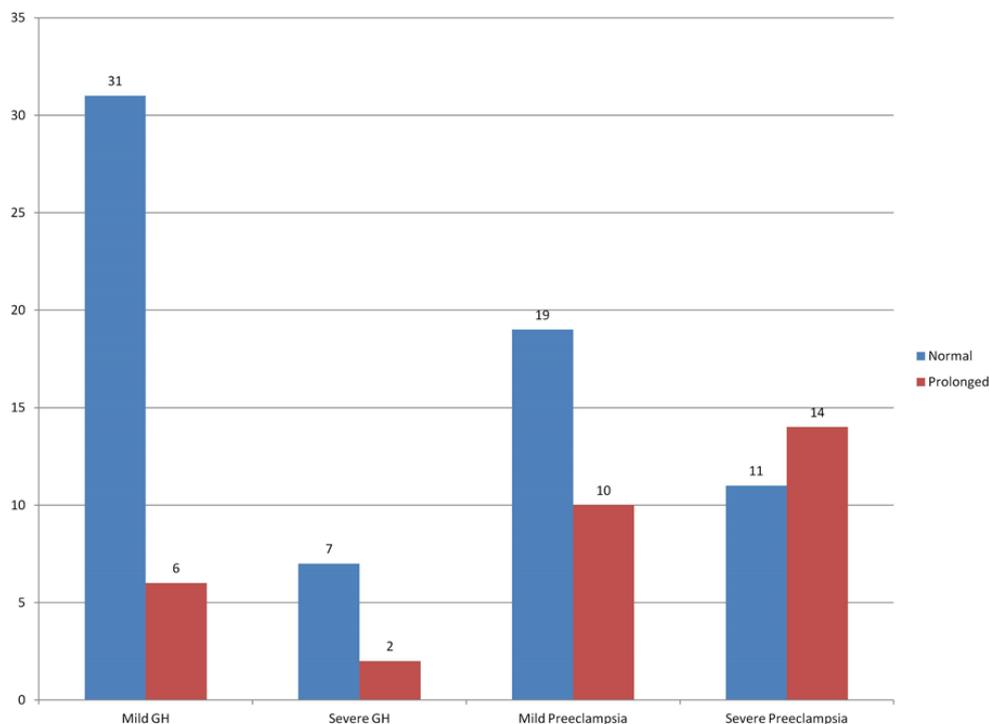
by giddiness (3%), epigastric pain (3%) and blurring of vision (3%). Prolonged PT was seen in 3 cases (8.2%) of mild GH, 02 cases (22.3%) of severe GH, 06 cases (20.7%)

mild preeclampsia and 4 cases (26%) of severe preeclampsia. None of these groups were showing statistical significant- yes, except in severe preeclampsia. With P value: 0.627. (Fig. 1) Prolonged aPTT was seen in 06 cases (16.3%) of mild GH, 02 cases

(22.3%) of severe GH, 10 cases (34.5%) of mild preeclampsia and 14 cases (56%) of severe preeclampsia. Significant raise in aPTT was seen only in severe preeclampsia. (P - Value: 0.128)(Fig. 2)



**Figure 1: Bar Chart Showing PT in Different Grades of PIH.**



**Figure 2: Bar Chart Showing APPT in Different Grades of PIH.**

D-Dimer was increased in 16 cases (43.2%) of mild GH, 5 cases (55.6%) of severe GH, 7 cases (24.1%) of mild preeclampsia and 10 cases (40%) of severe preeclampsia. (P value: 0.514) (Table. 3) Coagulation profiles of all different categories of PIH were compared and analysed for statistical significance. (Table. 4). Prolonged PT, aPTT and D-dimer were

seen in 15 cases, 42 cases and 38 cases respectively. There was increased mean aPTT of  $27.33 \pm 4.54$  and increased D-Dimer of  $0.35 \pm 0.33$  in severe preeclampsia patients. Hence we emphasize that raised aPTT and D-Dimer are alarming signs of preeclampsia and needs aggressive treatment.

**Table 3: Table showing D Dimer levels in different grades of PIH.**

D Dimer	Mild GH		Severe GH		Mild Preeclampsia		Severe Preeclampsia	
	No	%	No	%	No	%	No	%
<0.3	21	56.8	4	44.4	22	75.9	15	60.0
<b>0.3-1</b>	<b>16</b>	<b>43.2</b>	<b>5</b>	<b>55.6</b>	<b>7</b>	<b>24.1</b>	<b>10</b>	<b>40.0</b>
Total	37	100.0	9	100.0	29	100.0	25	100.0

**Table 4: Comparison of coagulation profile in different categories of PIH.**

Study variables	Mild GH	Severe GH	Mild Preeclampsia	Severe Preeclampsia	P value
Age in years	26.08 $\pm$ 3.51	25.67 $\pm$ 2.50	25.76 $\pm$ 3.02	25.6 $\pm$ 3.82	0.950
Weeks of gestation	37.16 $\pm$ 3.01	34.78 $\pm$ 3.35	36.21 $\pm$ 3.65	35.64 $\pm$ 3.66	0.169
PT	12.19 $\pm$ 2.63	13.07 $\pm$ 3.31	12.47 $\pm$ 3.62	11.68 $\pm$ 2.47	0.627
aPTT	25.11 $\pm$ 3.00	25.97 $\pm$ 3.25	26.74 $\pm$ 4.23	27.33 $\pm$ 4.54	0.128
D dimer	0.31 $\pm$ 0.35	0.30 $\pm$ 0.16	0.23 $\pm$ 0.19	0.35 $\pm$ 0.33	0.514

## DISCUSSION

Preeclampsia is an idiopathic multisystem disorder specific to human pregnancy and the puerperium.<sup>[5]</sup> Hematological abnormalities such as thrombocytopenia and decrease in some plasma clotting factors may develop in preeclamptic women.<sup>[2]</sup> 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 <sup>[6,7]</sup> and HELLP (hemolysis, enzyme elevation and low platelet) syndrome. From the historical point of view, earlier it was stated that only serial measurements of platelet count was adequate for intrapartum screening.<sup>[8]</sup> Later, combination of platelet count and aPTT, <sup>[6]</sup> platelet count and liver function tests,<sup>[9]</sup> platelet count and lactate dehydrogenase,<sup>[7]</sup> platelet count and antithrombin<sup>[10]</sup> were suggested for early detection and screening of the patients with preeclampsia.

It was observed that abnormal PT, aPTT and fibrinogen levels with platelet counts of less than 100,000/mm<sup>3</sup> were seen in preeclampsia. So the physician can safely follow the platelet counts of the patients with severe preeclampsia.<sup>[8]</sup> 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 26-30 years with mean of 25±3.02 which is comparable to Vamsheedhar et al,<sup>[11]</sup> Shivakumar S et al.<sup>[12]</sup> and Prakash J et al.<sup>[13]</sup> studies with mean

age of 24.57±3.46, 24.3 and 24.75±3.360 respectively, however in Onisai et al study he observed that the mean age of PIH was 29.8 years.<sup>[4]</sup>

In the present study 61% of PIH were of primigravidas and 53% of cases were preeclampsia as compared to other studies like Prakash et al. with 44%,<sup>[13]</sup> Audiebert et al. with 53.5% <sup>[14]</sup> and Jahromi et al. with 56% of cases.<sup>[15]</sup> In the present study PT was prolonged in 15% which is in concordance with the study conducted by FitzGerald et al.<sup>[16]</sup> aPTT was prolonged in 32% of PIH cases in our study as compared with other studies such as FitzGerald et al. wherein 25% of cases had a prolonged aPTT. However Onisai et al observed no change in PT and aPTT in their study.<sup>[4]</sup> In the present study D-Dimer levels increased in 38% of PIH cases which is in concordance with the study conducted by Takao et al. <sup>[17]</sup>

Prolonged PT, aPTT and D-Dimer was seen in 15 cases, 42 cases and 38 cases respectively in our study and increased mean aPTT of 27.33±4.54 and increased D-Dimer of 0.35±0.33 in severe preeclampsia patients is noted. Hence we emphasize that raised aPTT, D-Dimer are alarming signs for aggressive treatment.

## CONCLUSION

The coagulation parameters, especially aPTT and D-dimer can be used to monitor the progression of gestational hypertension to preeclampsia. Raised aPTT and D-dimer are fairly good indicator of severe preeclampsia and needs aggressive treatment.

**REFERENCES:**

1. Cunningham F.G, Kenneth J. Leveno, StevenL.Bloom, John C. Pregnancy induced hypertention. In: Kenneth J. Leveno, StevenL.Bloom editor. William Obstetrics, 23<sup>rd</sup> ed. New York:McGraw-Hill; 2010. p. 706-56.
2. Dutta D C. Pregnancy induced hypertention. In:Dutta DC editor. Textbook of Obstetrics including Perinatology and Contraception, 7<sup>th</sup> ed. Kolkata:New Central Book Agency(P)Ltd; 2011. p. 219-40.
3. Norwitz ER, Hsu CD, Repke JT.Acute complications of preeclampsia.ClinObstetGynecol2002;45:308-29.
4. Onisai M, Vladareaner AM, Bumbea H, Clorascu M, Pop C, AndreiC, et al. A study of haematological picture and of platelet function in preeclampsia-report of a series of cases. J of Clin Med 2009;4:326-7.
5. Norwitz ER, Hsu CD, Repke JT.Acute complications of preeclampsia.ClinObstetGynecol2002;45:308-29.
6. Metz J, Cincotta R, Francis M, DeRosa L, Balloch A. Screening for consumptive coagulopathy in preeclampsia. Int J GynecolObstet 1994;46:3-9.
7. Barron WM, Heckerling P, Hibbard JU, Fisher S. Reducing unnecessary coagulation testing in hypertensive disorders of pregnancy. ObstetGynecol 1999;94:364-70.
8. Leduc L, Wheeler JM, Kirshon B, Mitchell P, Cotton DB. Coagulation profile in severe preeclampsia. ObstetGynecol 1992;79:14-8.
9. Kramer RL, Izquierdo LA, Gilson GJ, Curet LB, Qualls R. "Preeclamptic labs" for evaluating hypertension in pregnancy. J ReprodMed 1997;42:223-8.
10. Osmanagaoglu MA, Topcuoglu K, Ozeren M, Bozkaya H. Coagulation inhibitors in preeclamptic pregnant women. Arch GynecolObstet 2005;271:227-30.
11. Annam V, Srinivas K, Yatnatti SK, Suresh DR. Evaluation of platelet indices and platelet counts and their significance in preeclampsia and eclampsia. Int J Biol Med Res 2011;2:425-28.
12. Sandhya S, Vishnu BB, Bhawana AB. Effect of pregnancy induced hypertension on mothers and their babies. Indian J Pediatr 2007;74:623-5.
13. Prakash J, Pandey LK, Singh AK, Kar B. Hypertension in pregnancy: Hospital based study. J Assoc Physicians India 2006;54:273-8.
14. Audibert F, Friedman SA, Frangieh AY, Sibai BM. Clinical utility of strict diagnostic criteria for the HELLP(Hemolysis,elevated liver enzymes,and low platelets)syndrome. Am J ObstetGynecol 1996;175:460-4.
15. Jahromi BN, Rafiee SH. Coagulation Factors in Severe Preeclampsia. Iranian Red Crescent Medical Journal 2009;11:321-4.
16. Fitzgerald MP, Floro C, Siegel J, Hernandez E. Laboratory Findings in hypertensive disorders of pregnancy. J Natl Med Assoc 1996;88:794-98.
17. Kobayashi T, Tokunaga N, Sugimura M, Kanayama N, Terao T. Predictive Values of Coagulation/Fibrinolysis Parameters for the Termination of Pregnancy Complicated by severe preeclampsia. SeminThrombHemost 2001;27:137-41.