

## STUDY OF PLATELET INDICES IN PREGNANCY INDUCED HYPERTENSION (PIH)

Nirmala T<sup>1</sup>, Vani B R.<sup>2</sup>, Murthy Srinivasa V.<sup>3</sup>, Deepak kumar B.<sup>4</sup>,  
Geetha R L<sup>5</sup>, Kumar Pradeep L.<sup>6,\*</sup>

<sup>1</sup>Junior resident/ PG Student, <sup>2,4</sup>Associate Prof., <sup>3</sup>Prof. & HOD, <sup>5</sup>Asst. Prof., Dept. of Pathology, ESICMCPGIMSR, Rajajinagar, Bangalore.

**\*Corresponding Author:**

E-mail: 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 increase in the procoagulant state of normal pregnancy are seen.

**Aims and Objectives:** Evaluation of Platelet indices in PIH. To identify the early platelet parameters predictive of preeclampsia and HELLP syndrome.

**Materials and methods:** A 2 year study was carried out in the Dept. of pathology ESIMC, Bangalore on 100 PIH cases. Platelet indices is done in all the cases. P values for all parameters were statistically derived and evaluated.

**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. Thrombocytopenia was observed in 23 cases and elevated MPV in 49 cases.

**Conclusion:** Thrombocytopenia is identified as the most common complications of PIH and at times may be life threatening. Therefore estimation of platelet indices can be considered as an early, simple and rapid procedure in the assessment of severity of pre-eclampsia and to prevent progression to HELLP syndrome and DIC.

**Key Words:** Hypertension, preeclampsia, eclampsia, Platelet indices.

### INTRODUCTION

Hypertension is one of the serious complication of pregnancy with an incidence of 5% to 7% of all pregnancies and is a leading cause of maternal and foetal morbidity, particularly in cases with preeclampsia and eclampsia. It may also present with superimposed chronic vascular disease.<sup>[1,2]</sup> Preeclampsia is a major cause of preterm birth and it is also an early marker for future cardiovascular and metabolic diseases in the newborns.<sup>[2-6]</sup> According to NHBPEP Working Group PIH is categorised as,<sup>[7]</sup>

1. Preeclampsia-eclampsia.
2. Chronic hypertension of any cause.
3. Preeclampsia superimposed on chronic hypertension.
4. Gestational hypertension.

Majority of the cases with chronic hypertension have uneventful gestations as

long as their blood pressure remains under control. In contrast, preeclampsia is associated with many serious complications. Thus, early diagnosis of preeclampsia and differentiating it from other causes of hypertension in pregnancy has a important role in the management.<sup>[8]</sup>

Preeclampsia is primarily characterized by hypertension and proteinuria. [ $>300$  mg/24 hours] Preeclampsia may also be accompanied by rapid weight gain and edema, appearance of coagulation or liver function abnormalities.<sup>[8]</sup>

Severe preeclampsia is characterised by blood pressure  $>160/110$  mm Hg, nephrotic range proteinuria, sudden oliguria, neurologic symptom like headache, hyperreflexia and laboratory tests demonstrating thrombocytopenia, hemolysis, or abnormal liver function, although the magnitude of proteinuria alone

as a predictor of severity has been questioned.<sup>[9, 10]</sup>

The eclamptic convulsion, which is a life-threatening complication of preeclampsia, was once associated with a maternal mortality of 30% in developing nation has now reduced due to early diagnosis and effective management of PIH.<sup>[11, 12]</sup> Platelet indices is one of the early, economical and rapid procedure for assessing the severity of PIH.<sup>[13]</sup>

Thrombocytopenia in pregnancy induced hypertensive women may be due to increased consumption of platelets or due to adherence of platelets at the site of damaged vascular endothelium resulting in secondary destruction of platelets.<sup>[14, 15]</sup>

### AIMS AND OBJECTIVES

Evaluation of Platelet indices in PIH. To identify the early platelet parameters predictive of preeclampsia and HELLP syndrome.

### MATERIALS AND METHODS

The study was carried out in the department of Pathology, ESIC-MC PGIMS, 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.

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.

After obtaining consent, under aseptic precaution, venous blood was collected in EDTA vacutainer tube. Sample was tested for platelet indices [platelet count, MPV, PDW and PLCR] with fully automated 5 part differential hematology analyser-TRANSIA Model-XT-2000i.

**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 platelet indices. 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.

**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

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 to30 age group. Mild and severe pre-

eclampsia was more frequent in the 26 to 30 age group, (16 and11cases respectively). This probably indicates that severity of complications increases with the age of the patient. (Table. 2)

**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

Of the hundred PIH cases, Sixty one cases (61%) were prim gravida and remaining Thirty nine cases (39%) were of multi gravida.

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%).

Out of 100 PIH cases, 23 cases had thrombocytopenia. Only two cases of severe preeclampsia had platelet count of less than 50000/mm<sup>3</sup> and two cases (8%) had platelet count of 50000 to 100000 cells/mm<sup>3</sup>. (Table-3)

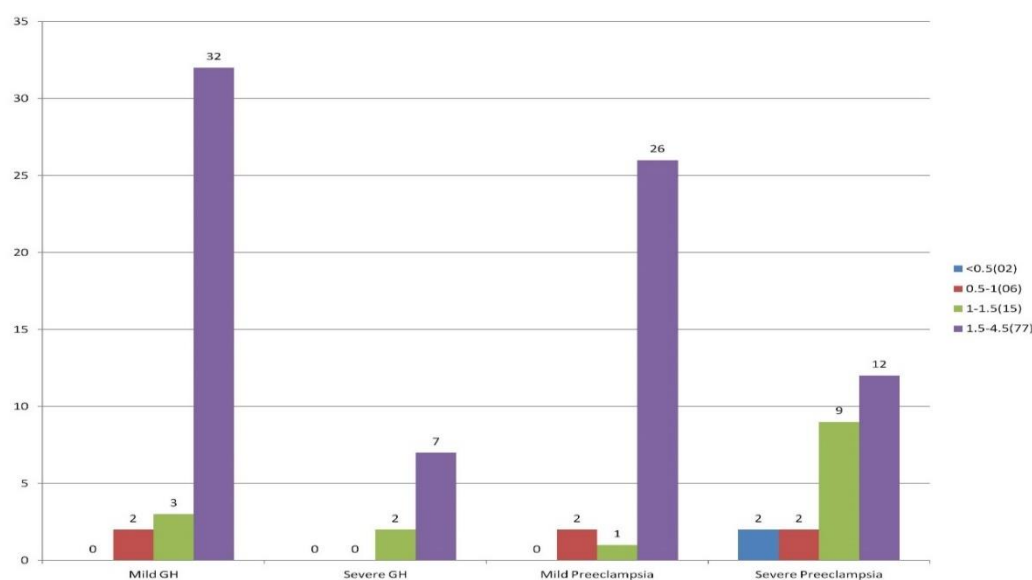
**Table 3: Platelet count in different stages of PIH.(Lakhs/ul)**

Platelet count (Lakhs/ul)	Mild GH		Severe GH		Mild Preeclampsia		Severe Preeclampsia	
	No	%	No	%	No	%	No	%
<0.5(02)	00	00	00	00	00	00	02	08
0.5-1(06)	02	5.4	00	00	02	6.8	02	08
1-1.5(15)	03	8.1	02	22.3	01	3.4	09	36
<b>1.5-4.5(77)</b>	<b>32</b>	<b>86.4</b>	<b>07</b>	<b>77.7</b>	<b>26</b>	<b>89.6</b>	<b>12</b>	<b>48</b>
Total	37	100.0	9	100.0	29	100.0	25	100.0

P value=0.001\*\*

Three cases (8.1%) of mild GH, two cases (22.3%) of severe GH, one case (3.4%) of mild preeclampsia and nine cases (36%) of severe preeclampsia had platelet count of 1-1.5

lakhs/cumm. Remaining 77cases had normal platelet count between 1.5-4.5 lakhs/cumm.(Fig1)



**Figure 1: BAR CHART SHOWING PLATELET COUNT IN PIH CASES. (No. of cases v/s severity of cases)**

Upon statistical analysis P value <0.001 was obtained between normal platelet count and thrombocytopenia.

MPV was increased in 12 cases (32.4%) of mild GH, six cases (66.7%) of

severe GH, 12 cases (41.4%) of mild preeclampsia, 19 cases (76%) of severe preeclampsia cases, which has got significant p value of 0.006. (Table- 4)

**Table 4: Combined chart of platelet indices (MPV (fL), PDW (fL) and PLCR (%))**

Platelet indices	Mild GH (n=37)		Severe GH (n=9)		Mild Preeclampsia (n=29)		Severe Preeclampsia (n=25)	
	No	%	No	%	No	%	No	%
<b>MPV (fL)</b>								
• 8-12	25	67.6	3	33.3	17	58.6	6	24.0
• >12	<b>12</b>	<b>32.4</b>	<b>6</b>	<b>66.7</b>	<b>12</b>	<b>41.4</b>	<b>19</b>	<b>76.0</b>
<b>PDW (fL)</b>								
• 9-14	25	67.6	7	77.8	12	41.4	20	80.0
• >14	<b>12</b>	<b>32.4</b>	<b>2</b>	<b>22.2</b>	<b>17</b>	<b>58.6</b>	<b>5</b>	<b>20.0</b>
<b>PLCR %</b>								
• 15-35	28	75.7	8	88.9	19	65.5	21	84.0
• >35	<b>9</b>	<b>24.3</b>	<b>1</b>	<b>11.1</b>	<b>10</b>	<b>34.5</b>	<b>4</b>	<b>16.0</b>

P value for MPV-0.006\*

12 cases(32.4%) of mild GH, two cases(22.2%) of severe GH,17 cases(58.6%) of mild preeclampsia and five cases(20%) of severe pre-eclampsia had increased PDW more than 14 fl. Only nine cases(24.3%) of mild GH, one case(11.1%) of severe GH, 10 cases(34.5%) of mild preeclampsia and four cases(16%) of severe preeclampsia had PLCR of >35.

PDW, PLCR were statistically found to be not significant. So thrombocytopenia is an important impending sign for PIH going for preeclampsia and eclampsia.

## DISCUSSION

Pre-eclampsia is one of the major cause of maternal and perinatal mortality and morbidity worldwide, particularly in developing countries.<sup>[16]</sup> Preeclampsia affects approximately 6% of all pregnancies, more often in primigravidas in the age group of 20-30 years. Preeclampsia accounts for 17.6% of maternal deaths in the United States.<sup>[17]</sup>

Approximately 50% of patients with preeclampsia will develop thrombocytopenia. Severity will be usually proportionate to that of the underlying pathology. But in few cases, the onset of thrombocytopenia precedes other manifestations of preeclampsia.<sup>[18]</sup>

Though the pathogenesis of thrombocytopenia in patients with preeclampsia is not well understood, recent studies suggest that the megakaryocytopoiesis impairment as a pathogenic factor.<sup>[19, 20]</sup>

In the present study a total of 100 PIH cases referred to the department of pathology from ANC clinic were evaluated for platelet indices. 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>[13]</sup> Shivakumar S et al.<sup>[21]</sup> and Prakash J et al.<sup>[22]</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>[23]</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>[22]</sup> Audiebert et al. with 53.5% <sup>[24]</sup> and Jahromi et al. with 56% of cases.<sup>[25]</sup>

In the our study mean platelet count in pre-eclampsia was 1.7 Lakhs/cu mm which is comparable to Indian studies done by Vamsheedhar et al <sup>[13]</sup> and Mohapatra et al, which were showing 1.5 Lakhs/cu mm and 1.8 Lakhs/cu mm respectively.<sup>[26]</sup> Mean platelet count in GH was 1.95 Lakhs/cu mm which is agreeable with Kulkarni et al,<sup>[27]</sup> Dube

et al and FitzGerald studies. However Anila et al.<sup>[27]</sup> and Vrunda et al.<sup>[28]</sup> observed very low platelet count of 1.2 Lakhs/ cu mm & 1.4 Lakhs/cu mm respectively.

In our study MPV was increased in 49% of PIH cases, PDW was increased in 36% of PIH cases and PLCR was increased in 24% of PIH cases. Of these only the MPV values were found to be statistically significant.

Analysing the above observations we can arrive at a conclusion that the thrombocytopenia worsens as PIH progresses from gestational hypertension to

eclampsia, so it is advised to monitor platelet count, which is a simple, economical and rapid investigation to monitor the progress of PIH.

## CONCLUSION

Thrombocytopenia is identified as the most common complications of PIH and at times may be life threatening. Therefore estimation of platelet indices can be considered as an early, simple and rapid procedure in the assessment of severity of pre-eclampsia and to prevent progression to HELLP syndrome and DIC.

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