

## Study of peripheral smear examination, platelet count, prothrombin time, activated partial thromboplastin time in pregnancy induced hypertension

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### Abstract

**Objectives of the study:** To study the peripheral smear, platelet count, PT, APTT in cases of pregnancy induced hypertension. To study the extent to which these changes are associated with the severity of preeclampsia and eclampsia.

To study the frequency of these pregnancy induced hypertension cases that cause changes in the above haematological findings. To study the severity of pregnancy induced hypertension on peripheral smear findings, platelet count, PT, APTT values.

**Material and Method:** A total of 350 patients with pregnancy induced hypertension were taken for study from November 2012 to April 2014. Platelet count, prothrombin time(PT) & activated partial thromboplastin time(aPTT) were measured and peripheral smear examination was done.

**Results:** Out of 350 cases of PIH, most common were patients with mild gestational hypertension(n=159) followed by severe preeclampsia(n=78), mild preeclampsia (n=67) and severe gestational hypertension(n=41) and 5 cases of HELLP syndrome. The main hematological abnormalities were anemia and prolonged prothrombin time. The other significant findings were of thrombocytopenia and prolonged activated partial thromboplastin time. The most common age incidence was 21 to 25 years. The most common peripheral smear finding was microcytic hypochromic anemia.

**Conclusion:** Hypertension is a common medical complication of pregnancy which contributes significantly to the maternal and perinatal mortality and morbidity. Thus the knowledge of clinical signs and symptoms of PIH and abnormal hematological findings is essential for the effective management of these patients.

**Keywords:** Pregnancy induced hypertension, Thrombocytopenia, PT

### Introduction

Hypertension is one of the common medical complication of pregnancy and contributes significantly to the maternal, perinatal mortality and morbidity.<sup>(1)</sup>

The identification of this clinical entity and effective management plays a significant role in the outcome of pregnancy.<sup>(1)</sup>

Pregnancy induced hypertension (PIH) is defined as hypertension that develops as a direct result of the gravid state. It includes i. Gestational hypertension, ii. Preeclampsia, iii. Eclampsia. Gestational hypertension previously named as pregnancy induced hypertension (PIH) is further classified as mild and severe depending on severity of blood pressure. When gestational hypertension is associated with significant proteinuria (>300 mg/24 hours) the term preeclampsia is used. When preeclampsia is complicated by convulsions or coma, it is categorised as eclampsia.<sup>(4,5)</sup>

Various haematological changes like numerical and functional platelet abnormalities, alteration in haemoglobin, erythrocyte parameters and increase in the procoagulant state of normal pregnancy are seen. Among these, thrombocytopenia is identified as the most common and at times may be life threatening. Coagulation studies like PT, APTT, fibrinogen assay, fibrin degradation product and D-dimer determinations are commonly performed in PIH.<sup>(4)</sup>

HELLP syndrome is a multisystem disorder characterised by evidence of haemolysis, hepatic dysfunction and thrombocytopenia. HELLP syndrome is frequently associated with 20% of women with

severe preeclampsia or 10% with eclampsia but can also be diagnosed in the absence of these disorders.<sup>(4)</sup>

### Aims and Objectives of the study

- To study the peripheral smear, platelet count, PT, APTT values in cases of pregnancy induced hypertension.
- To study the extent to which these changes are associated with the severity of preeclampsia and eclampsia.
- To study the frequency of these pregnancy induced hypertension cases that cause changes in the above haematological findings.
- To study the severity of pregnancy induced hypertension on peripheral smear findings, platelet count, PT, APTT values.

### Materials and Method

The study was conducted in the department of pathology KIMS Hubli from November 2012 to April 2014. Total of 350 cases were diagnosed as PIH from ANC clinics, wards and labor room and subsequently referred to department of pathology for hematological evaluation. Clinical details of all cases were documented. Those cases with pre-existing hypertension, having 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.

Clinical examination, complete hemogram with peripheral smear examination, coagulation profiles such

as PT, APTT and urine albumin were carried out in all cases. Also AST, ALT and LDH were done for HELLP syndrome cases.

After obtaining informed consent from all patients venous blood was collected using 21 G disposable needle and disposable plastic syringe, under aseptic precautions. 4cc of blood was collected for the tests. Of this 2 cc was collected in EDTA bulb for determination of hemoglobin, total WBC count and platelet count and to prepare peripheral smear. This was determined by using Sysmex KX-21 and Sysmex XP-100 automated blood cell counter.

1.8cc of venous blood was collected in citrate bulb – 9 parts mixed with one part of trisodium citrate (3.2%) i.e. 1.8cc of blood + 0.2 ml citrate. This sample was centrifuged immediately for 15mins at 1500-3000rpm and platelet poor plasma transferred to a clean test tube and subjected to tests such as PT with INR, APTT in fully automated coagulation analyzer.

Random urine samples were collected and analysed for albumin by dip-stick method and microscopy.

Complete blood count, peripheral smear study of RBC, WBC, platelets, type of anemia were studied. Results of coagulation tests, biochemical tests were analysed and tabulated. Cases of HELLP syndrome were documented.

**Statistical Methods:** Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented in Mean  $\pm$  SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance.

Analysis of variance (ANOVA) test has been used to find the significance of study parameters on categorical scale between two or more groups.

**Statistical software:** The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables

## Results

Total of 350 cases referred to department of pathology, KIMS Hubli for hematological evaluation were studied.

Out of 350 PIH cases, 16.8 % (59 cases) were in the age group of 16-20 years, 56.28 % (197 cases) were in the age group of 21-25 years, 19.7% (69 cases) were in the age group of 26-30 years, remaining 06% (21 cases) were in the age group of 31-35 years. In the present study, majority of PIH cases were seen in the age group of 21-25 years followed by age groups of 26-30 years and 16-20 years. And least number of PIH cases were seen in the age group of 31-35 years.

Mild and severe gestational hypertension cases were most common in age group of 21 to 25 years (86 cases and 25 cases respectively) and also most cases of mild and severe pre-eclampsia were seen in the same age group (38 and 48 cases respectively). Least number of mild & severe gestational hypertension cases (14 cases and 02 cases respectively) and mild and severe pre-eclampsia cases (02 and 07 cases respectively) were seen in the age group of 31-35 years. There was no statistically significant difference in the age distribution with respect to severity of PIH cases.

Out of the 350 PIH cases, 228 cases (65%) were primigravida and remaining 122 cases (34.85%) were multi gravida 159 cases (45.42%) had mild GH and 41 cases (11.71%) had severe GH, 67 cases (19.14%) had mild preeclampsia and 83 cases (23.71%) had severe preeclampsia.

In the present study, 93 cases (58.4 %) of mild GH, 21 cases (51.2%) of severe GH and 31 cases (46.26%) of mild preeclampsia, 46 cases (55.12%) of severe preeclampsia had haemoglobin <10.5 gm%. 66 cases (41.5%) of mild GH and 20 cases (48.78%) of severe GH and 36 cases (53.73%) of mild preeclampsia, 37 cases (44.87%) of severe preeclampsia cases had haemoglobin level between 10.5-15gm%.

**Table 1: Showing Platelet count (Lakhs/cumm) observed in PIH cases in present study**

| Platelet count<br>Lakhs/cumm | Mild GH |      | Severe GH |      | Mild<br>preeclampsia |      | Severe<br>preeclampsia |      |
|------------------------------|---------|------|-----------|------|----------------------|------|------------------------|------|
|                              | Number  | %    | Number    | %    | Number               | %    | Number                 | %    |
| <0.5                         | 6       | 3.77 | 0         | 0    | 2                    | 2.98 | 7                      | 8.43 |
| 0.5-1.0                      | 7       | 4.4  | 5         | 12.1 | 7                    | 10.4 | 7                      | 8.43 |
| 1-1.5                        | 7       | 2    | 5         | 12.1 | 4                    | 5.97 | 7                      | 8.43 |
| 1.5-4.5                      | 139     | 87.4 | 31        | 75.6 | 54                   | 80.5 | 62                     | 74.6 |
|                              | 159     |      | 41        |      | 67                   |      | 83                     |      |

F= 1.235

P value > 0.05 – Not significant

**Table 2: Showing Prothrombin Time (PT) in PIH cases in present study**

| PT(sec)   | Mild GH |       | Severe GH |       | Mild Preeclampsia |       | Severe preeclampsia |       |
|-----------|---------|-------|-----------|-------|-------------------|-------|---------------------|-------|
|           | Number  | %     | Number    | %     | Number            | %     | Number              | %     |
| Normal    | 77      | 48.42 | 23        | 56.09 | 18                | 26.86 | 30                  | 38.14 |
| Prolonged | 82      | 51.57 | 18        | 43.9  | 49                | 73.13 | 53                  | 63.85 |
| Total     | 159     |       | 41        |       | 67                |       | 83                  |       |

F = 4.39

P value &lt;0.05 Significant

**Table 3: Showing APTT values in PIH cases in present study**

| APTT(sec) | Mild GH |       | Severe GH |       | Mild preeclampsia |       | Severe Preeclampsia |       |
|-----------|---------|-------|-----------|-------|-------------------|-------|---------------------|-------|
|           | Number  | %     | Number    | %     | Number            | %     | Number              | %     |
| Normal    | 119     | 74.84 | 34        | 82.92 | 49                | 73.13 | 54                  | 65.06 |
| Prolonged | 40      | 25.15 | 7         | 17.07 | 18                | 26.86 | 29                  | 34.93 |
| Total     | 159     |       | 41        |       | 67                |       | 83                  |       |

F- value: 2.04

P-value &gt;0.05 Not significant

Prolonged APTT was seen in 40 cases (25.15 %) of mild GH, 07 cases(17.07%) of severe GH,18 cases(26.86 %) of mild preeclampsia and 29 cases(34.93 %) of severe preeclampsia.

**Table 4: Showing Peripheral smear findings in PIH cases in the present study**

|                   | Mild GH | Severe GH | Mild preeclampsia | Severe preeclampsia |
|-------------------|---------|-----------|-------------------|---------------------|
| NNBP              | 49      | 13        | 21                | 17                  |
| MCHA              | 30      | 7         | 18                | 19                  |
| NCHA              | 16      | 5         | 0                 | 11                  |
| Dimorphic Anemia  | 26      | 8         | 13                | 11                  |
| NCNA              | 27      | 6         | 11                | 14                  |
| MAHA              | -       | -         | -                 | 2                   |
| Macrocytic Anemia | 10      | 01        | 04                | 06                  |
| Pancytopenia      | 2       | 1         | 1                 | 1                   |

**Table 5: Showing PIH cases with HELLP syndrome in the present study**

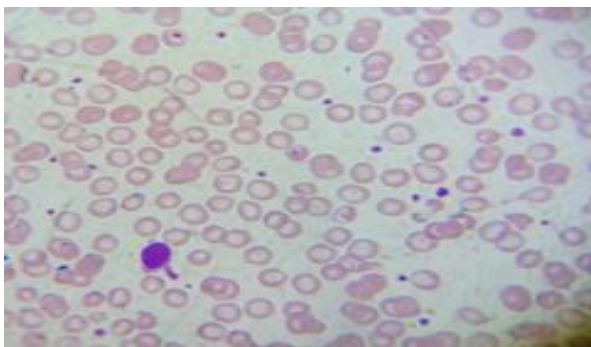
|                              | Case 1                  | Case 2 | Case 3   | Case 4   | Case 5                           |
|------------------------------|-------------------------|--------|----------|----------|----------------------------------|
| Hb%                          | 7.3                     | 9      | 6.7      | 11       | 9                                |
| Platelet count               | 1.2                     | 1.1    | 0.8      | 0.49     | 0.29                             |
| Peripheral smear examination | DMA<br>LEUCOCY<br>TOSIS | DMA,NL | NCNCA,NL | NCNCA,TP | NCNCA, TP<br>fragmented<br>RBCs. |
| PT                           | 13.5                    | 16.3   | 13.9     | 13.4     | 15.9                             |
| APTT                         | 29.2                    | 29.1   | 29.5     | 25.6     | 27.4                             |
| Serum bilirubin(mg/dl)       | 1.3                     | 1.8    | 1.9      | 1.4      | 1.3                              |
| AST(U/L)                     | 90                      | 518    | 380      | 120      | 90                               |
| ALT(U/L)                     | 48                      | 488    | 246      | 98       | 48                               |

**Table 6: Comparison of study variables in the present study**

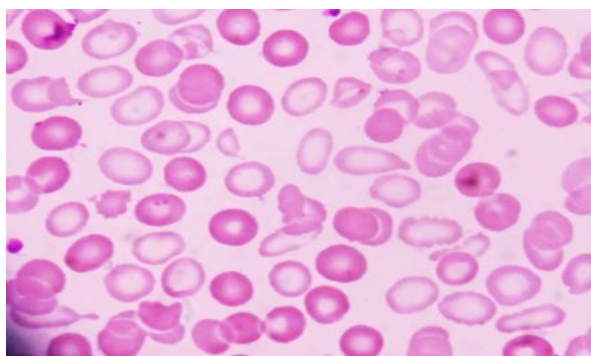
| Study variables | Mild GH      | Severe GH    | Mild preeclampsia | Severe Preeclampsia | F value         |
|-----------------|--------------|--------------|-------------------|---------------------|-----------------|
| Age in years    | 24.28+/-4.68 | 23.9+/-3.16  | 23.53+/-4.39      | 24.46+/-3.88        | 0.693<br>P>0.05 |
| Hb %            | 10.01+/- 2.7 | 10.23+/- 2.8 | 10.86+/- 2.29     | 9.10+/-2.93         | 5.453<br>P<0.05 |
| PLT             | 2.6+/- 1.009 | 2.22+/-0.975 | 2.59+/-1.255      | 2.39+/-1.18         | 1.23            |

| (Lakhs/ul) |              |              |               |              | P>0.05         |
|------------|--------------|--------------|---------------|--------------|----------------|
| PT         | 14.6+/-2.29  | 14.34+/-1.30 | 14.60+/- 2.02 | 15.5+/-2.11  | 4.39<br>P<0.05 |
| APTT       | 26.74+/-3.88 | 25.28+/-5.07 | 27.11+/-3.35  | 26.45+/-3.71 | 2.04<br>P>0.05 |

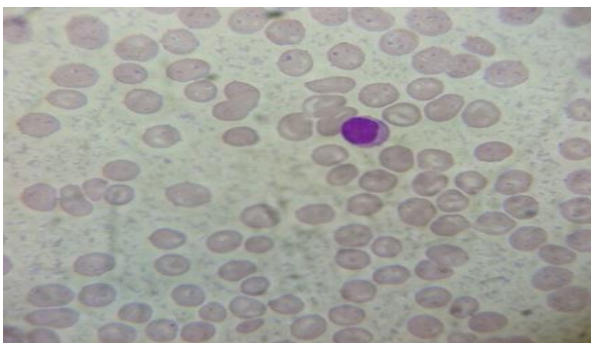
All study parameters were subjected to ANOVA test for statistical significance. Statistically significant difference was found in Hemoglobin and Prothrombin time values with  $p < 0.05$ , when compared with other study groups. Other parameters like age distribution, platelet count, APTT values were statistically insignificant



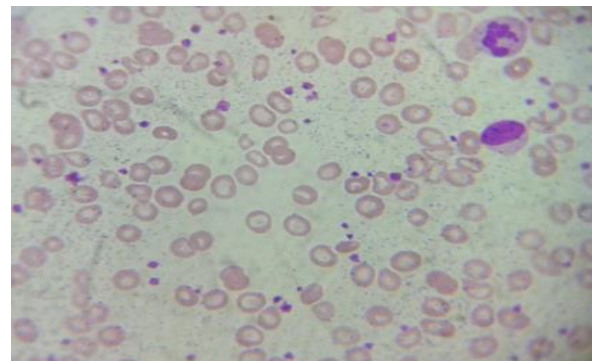
**Fig. 1: Peripheral smear showing normocytic hypochromic ANEMIA (Leishman Stain 1000X)**



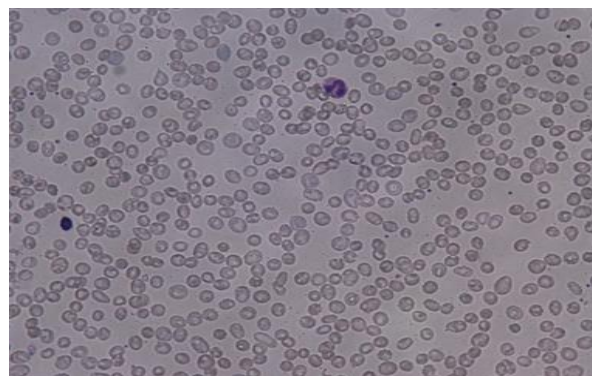
**Fig. 2: Peripheral smear showing microangiopathic haemolytic anemia picture. Fragmented RBCS Seen (Leishman Stain 1000X)**



**Fig. 3: Showing RBCS in Macrocytic Anemia (Leishman Stain 1000X)**



**Fig.4: Peripheral smear showing microcytic hypochromic anemia (Leishman Stain 1000X)**



**Fig.5: Peripheral smears of pancytopenia (Leishman Stain 400X)**

### Discussion

Total of 350 PIH cases were referred to department of pathology, KIMS HUBLI from department of Obstetrics and Gynecology. These cases were evaluated and compared with other studies.

In the present study majority of PIH cases were in the age group of 21-25 years which is similar to other studies. Present study is comparable to Vamsheedhar et al, Shivakumar S et al, and Prakash J et al studies. However in a study done by Onisai et al they observed that the mean age of PIH cases was 29.8 years.

In the present study 65% of PIH cases were primigravidas, which is similar to studies done by Prakash J et al & Shivkumar S. et al.

In the present study 42.85% of cases were preeclampsia which is similar to the findings of studies done by Prakash et al, Audebert et al, Jahromimi et al. However Fitz Gerald et al reported that 85% of cases had preeclampsia. HELLP syndrome cases accounted for 1.4% in the present study, which is less than the incidence reported in studies done by Prakash et al, Audebert et al, Jahromimi et al.

In present study mean Hb% in severe preeclampsia was 9.10+/- 2.93 which is similar to the study done by Jahromi et al who observed mean Hb% of 10.8±2.

In the present study mean platelet count in pre eclampsia was 2.44 Lakhs/cumm which is comparable to values reported in study done by Giles et al. Mean platelet count in gestational hypertension was 2.54 Lakhs/cumm which is comparable with studies of Vrunda et al and Giles et al. However Anila et al and Vrunda et al observed very low platelet count of 1.2 Lakhs/ cu mm & 1.4 Lakhs/cu mm respectively in cases of preeclampsia.

### Conclusion

Among the various hematological parameters studied, hemoglobin and prothrombin test values were statistically significant in determining severity of PIH. The study gives a guidelines for investigation to be done in cases of PIH which can alert the obstetrician, of the severity of the disease so that appropriate and timely management can be initiated. Also it proves the importance of peripheral smear examination which is very simple and cost effective and can detect the red cell abnormalities, quantitative abnormalities of platelets which are commonly seen in PIH.

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