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## Study of Erythrocyte and Erythrocyte Indices in Predicting Preeclampsia in Rural Hospital, Western Maharashtra, India.

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### ABSTRACT

Pregnancy-induced hypertension i.e. preeclampsia is the most common medical disorder of pregnancy that often results in multi-organ failure with poor maternal and fetal outcomes. The study aimed to investigate the erythrocyte (RBC), haematocrit (HCT) & erythrocyte indices (red blood cell indices) in PIH patients in their third trimester. The Study was carried out in Department of Physiology in collaboration with Department of Obstetrics and Gynecology, Rural Medical College, Loni. Total of 152 subjects were studied. 82 healthy pregnant women (control group) and 70 PIH patients (case group). PIH patients were diagnosed cases by the department of Obstetrics and gynecology. Laboratory findings i.e. red blood cells, hemoglobin, hematocrit and red blood cell indices of the given patients and control was noted. The present study shows a significant difference in HB, hematocrit, MCV and MCHC in pregnant women and women with preeclampsia, P-value <0.05. It is also found that the RBC, MCH value is lower in pregnant women than the preeclamptic women but the difference is not significant. The present study shows a significant change in the CBC parameters like HB, haematocrit, MCV, MCHC in preeclamptic patients which will help the clinician for early assessment and prevention of development of preeclampsia in pregnant women and preventing its complication and maternal deaths.

**Keywords:** Red blood cell, red blood cell indices, preeclampsia

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## INTRODUCTION

Hypertensive disorders complicate 5–10% of all pregnancies and together they form one member of the deadly triad, along with haemorrhage and infection that contribute greatly to the maternal morbidity and mortality rates. Pregnancy-induced hypertension is the most common medical disorder of pregnancy that often results in multi-organ failure. Pregnancy induced hypertension is defined as hypertension that occurs in pregnancy for the first time after 20 weeks of gestation and disappears following delivery [1]. PIH has been divided into four categories as recommended by the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy [2] i.e. Gestational hypertension, Pre-eclampsia and Eclampsia, Chronic hypertension of any aetiology and preeclampsia superimposed on chronic hypertension. Preeclampsia is defined as BP>140/90 or higher, measured on at least two occasions, 2 h apart after 20 weeks of gestation and proteinuria (300mg or more of urinary protein for 24hrs or 100mg/dl or more in at least two random urine specimens collected 6 or more hours apart) [3]. Severe preeclampsia when BP of 160/110 or higher measured on two occasions at least 6 h apart and Proteinuria of >5 g in 24 h or proteinuria equal to or greater than +3 as measured by urinary reagent strips in at least two random specimens collected 4hr apart or oliguria < 400 ml in 24 h, or cerebral or visual disturbances.

Out of all the haematological changes that occur in pre-eclampsia and eclampsia, thrombocytopenia is the most common haematological abnormality found [4]. Diagnosis of complications of PIH depends on many signs and symptoms as well as laboratory tests [4]. Preeclampsia also represents a state of increased hematocrit levels. It has been found that a fall in hematocrit values may denote clinical improvement [5]. However, less literature is present showing the relationship between red blood cell, red blood cell indices and preeclampsia. Predicting the risk of preeclampsia early in pregnancy with an effective, simple and economic laboratory method is important to prevent complications and improve outcomes. Thus, the aim of this study was to investigate the erythrocyte (BBC), haematocrit (HCT) & erythrocyte indices (red blood cell indices) in PIH patients in their third trimester.

## METHODS

### Study design

The present study is a case control study.

### Study area

The Study was carried out in Department of Physiology in collaboration with Department of Obstetrics and Gynecology, Dr BVP Rural Medical College, Loni.

### Study subjects

Total of 152 subjects were studied. 82 healthy pregnant women (control group) and 70 PIH patients (case group).

### Study conduct

The study was carried out after ethical approval of the Institute and after taking informed consent from the subjects. The demographic details of the patient like age, weight, height was noted. The BMI of the subject was calculated using weight and height. The study population was divided in two groups, PIH patients (cases) and healthy pregnant women (control). PIH patients were diagnosed cases by the department of Obstetrics and gynecology.

The cases was further categorized into 2 different categories

### Group A

Non-severe/mild pre-eclampsia: Systolic blood pressure between 140- and 160-mm Hg and diastolic blood pressure between 90- and 110-mm Hg, proteinuria up to 1+.

**Group B**

Severe/moderate pre-eclampsia: Systolic blood pressure between >160 mm Hg and diastolic blood pressure >110 mm Hg, proteinuria >1. Haemoglobin, haematocrit, red blood cell and red blood cell indices were counted using Automated Haematology System. Laboratory findings i.e. red blood cells, hemoglobin, hematocrit and red blood cell indices of the given patients and control was noted.

**Inclusion Criteria**

- Patients with preeclampsia as defined by American College of Obstetricians and Gynaecologists guidelines.
- Non-smoker.
- Healthy pregnant women and PIH patients with age of 20-35yrs.
- Healthy pregnant women and PIH patients with gestational weeks of 30-42.

**Exclusion Criteria**

- History of hypertension before pregnancy or before 20 week and on antihypertensive treatment for the same.
- Pre-existing medical disorders - diabetes mellitus, renal disease, any coagulopathies, chronic hypertension, and thyroid disorder.
- Smokers, alcoholics.
- Any ongoing infection, systemic inflammatory condition or any autoimmune disease.
- Patients with any pregnancy complications like membrane rupture, intrauterine fetal death (IFUD) or multifetal gestation.
- Placental abruption or previa.

**RESULTS**

Total of 152 subjects were studied. In which 82 healthy pregnant women (control group) and 70 PIH (case group).

**Table 1: Demographic details of control and case**

Parameter	Control (N-82)	Group A (N-49)	Group B (N-21)	P- value
Age	23.6 ± 3.103	24.76 ± 3.67	23.29 ± 3.82	0.099
Weight	58.35 ± 7.8	58.12 ± 7.05	56.95 ± 4.81	0.799
Height	156.2 ± 8.02	155.59 ± 7.22	153.04 ± 4.018	0.230
BMI	24.013 ± 3.46	24.016 ± 2.52	24.33 ± 2.10	0.915

There was no significant difference in the mean age, weight, height and BMI of cases and control (Table.1).

**Table 2: Red blood cell (RBC), Haemoglobin (HB), Hematocrit (HCT), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC) in control and case**

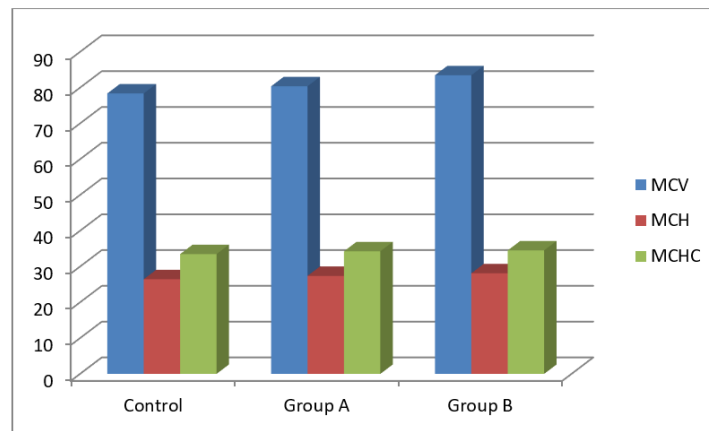
Parameter	Control (N-82)	Group A (N-49)	Group B (N-21)	P- value
RBC	4.38 ± 0.57	4.44 ± 0.66	4.61 ± 0.56	0.229
HB	11.56 ± 2.016	11.918 ± 1.78	12.71 ± 1.57	0.028*
HCT	34.27 ± 5.001	34.89 ± 4.09	36.65 ± 4.21	0.049*
MCV	78.38 ± 7.86	80.38 ± 6.75	83.47 ± 4.87	0.008*
MCH	26.46 ± 3.59	27.39 ± 2.59	28.13 ± 1.93	0.080
MCHC	33.48 ± 2.12	34.255 ± 1.17	34.524 ± 1.23	0.040*

Significance\*(P<0.05)

There was a significant difference found in the mean value of HB, HCT, MCV, MCHC between control and cases using Kruskal Wallis T test. On post Hoc analysis it is found that there is a significant

difference between control and Group B. There is also a difference in the Control and Group A cases but the difference is not significant.

**Graph 1: Graph showing the difference in the red blood cell indices in control and cases.**



### DISCUSSION

The incidence of pre-eclampsia in India varies from 5% to 15% [6, 7], leading to health risks for both mother and fetus. In addition, the fetus is also compromised with the risk of complications leading to poor fetal outcome. The exact pathophysiology of PIH is still a concern, present study was undertaken to evaluate erythrocyte and erythrocyte indices role in preeclampsia. In the current study there is no difference in the demographic details like age, weight, height and BMI.

In the present study it was found that there is no significant difference in the red blood cell count (erythrocytes) in control and cases the finding is similar to study done by Tobing et.al [8], shows that there was no difference in the RBC in control and cases. In our study we found a significant difference found in the haemoglobin (HB) and haematocrit level (HCT) amongst control and group B cases but there was no difference found between control and group A cases. Sankar basak et.al [9] found that haematocrit value is more in mild and severe preeclamptic women than normal pregnant women which is similar to our finding. The results of the present study disagree with the study results carried out by Neelam Jhaharia [10] and colleagues, shows haemoglobin level has been decreased in preeclamptic patient as compared to control group. During pregnancy, the haematocrit value normally decreases as the fluid in the blood i.e. plasma increases, making red blood cells less concentrated. But preeclampsia causes the body tissue to absorb fluid i.e. plasma, resulting in concentration of red blood cells and an increased haematocrit level. Studies have shown that RBC deformability is reduced in women with PE and contributed to reduced microcirculation leading to uterine growth retardation [11]. Previous studies also found that enlarged and unstable RBC membrane due to increase oxidative stress leads to RBC aggregation and an increase in blood viscosity which impairs proper tissue perfusion in the placental intervillous space in patients of PE. Damaged RBCs also found to enhance the progression of endothelial dysfunction and maternal circulatory disorders [12, 13]. Low plasma volume or high hematocrit especially in second and third trimester are associated with increased frequencies of fetal growth retardation, fetal death, preterm deliveries and Preeclampsia [14, 15]. The study shows a significant increase in MCV and MCHC but decrease in MCH in severe preeclamptic patients as compared to the control group. This finding is in agreement with the study done by Hafiz Ahmed [16]. Yıldız C et.al [17] also found increase in MCV in preeclamptic women. The elevation of those parameters which revealed by the present study might be due to endothelial damage that associated with preeclampsia.

### CONCLUSION

The complete blood count (CBC) is routinely reported in every pregnant woman and it is a feasible, cheaper and easily available test in the hospital. The present study shows a significant change in the CBC parameters like HB, haematocrit, MCV, MCHC in preeclamptic patients which will help the clinician for early assessment and prevention of development of preeclampsia in pregnant women and preventing its complication and maternal deaths.

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