

Study On Prognostic Role Of Low Platelet Count In Preeclampsia And Eclampsia

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Compliance with ethical standards

Conflict of interest – Dr Kumari Renu, Dr. Rita Shukla Dr Meenakshi Devi, declare that they have no conflict of interest.

Informed Consent–Informed consent was obtained from all individual participants included in the study.

Abstract- Aim: For predicting the severity of preeclampsia and eclampsia, thrombocytopenia remains the most consistent and reliable method. This study aimed to correlate the prognosis of preeclampsia and eclampsia with low platelet count. **Design:** prospective study **Method:** study was conducted on 200 pregnant women more than 20 weeks of gestation attending OPD or Inpatients in the Department of Obstetrics and Gynecology, SRN and KMNH Hospital, MLNMC, Prayagraj from September 2018 to September 2019. The study group were divided into cases and controls. Cases were further divided into mild preeclampsia, severe preeclampsia and eclampsia. Investigations like platelet count, LFT, RFT, CT, BT and Coagulation profile were done. **Result:** The mean platelet count observed among cases of mild preeclampsia, severe preeclampsia and eclampsia was 2.39, 1.08 and 0.90 lacs/mm³ respectively. Among cases and controls the difference in mean platelet count was statistically significant. **Conclusion:** Low platelet count is the most common complication of preeclampsia and eclampsia and at times is life threatening. Therefore platelet count alongwith other investigations can be used to assess the severity and disease progression to HELLP syndrome, DIC and PPH.

Index Terms- preeclampsia, eclampsia, platelet count

I. INTRODUCTION

Hypertensive disorder remains most significant & intriguing Unsolved problem in Obstetrics. In developed countries 17% maternal deaths were attributed to HTN disorders. In India they account for the third most important cause of maternal mortality.¹World Health Organization estimates around six lac women die each year from preeclampsia.²Preeclampsia is defined as occurrence of new onset HTN with blood pressure $\geq 140/90$ mm Hg after 20 weeks of gestation in women with previously normal

BP with or without proteinuria. Thus, proteinuria is an objective marker & reflects the system wide endothelial leak, which can be seen in preeclampsia syndrome.

1) Proteinuria greater or equal to 300 mg per 24hour urine collection. Or protein creatinine ratio greater than or equal to 0.3 or Dipstick reading of 1+ (used only if other quantitative methods not available. Proteinuria is recognized as an independent risk factor for cardiovascular and renal disease and as a predictor of end organ damage.³

2) Or in absence of proteinuria new onset hypertension with the new onset of any of following-

- a) Thrombocytopenia- platelet count less than 1.5 lac/ mm³.
- b) Renal insufficiency –serum creatinine concentration greater than 1.1mg/dl or a doubling of serum concentration in the absence of renal disease.
- c) Impaired liver function- elevated serum concentration of liver transaminases to twice normal concentration.
- d) Cerebral symptoms –headache, visual disturbances, convulsions.
- e) Pulmonary edema.

Eclampsia is defined as preeclampsia along with convulsions, seizures are generalized & may appear before, during or after labor. Eclampsia is most common in last trimester.

ETIOLOGY

- a) Placental implantation with abnormal trophoblastic implantation of uterine vessels.⁴
- b) Immunological maladaptive tolerance between maternal, paternal (placenta) & fetal tissue.⁵
- c) Maternal maladaptation to cardiovascular or inflammatory changes of normal pregnancy.
- d) Genetic factors including inherited predisposing genes & epigenetic influences.

PATHOGENESIS

1. Vasospasm
2. Endothelial cell injury
3. Increased pressure response

THROMBOCYTOPENIA

The platelet count is routinely measured in women with any form of gestational HTN. Overt thrombocytopenia defined by a

platelet count $<1,00,000/\mu\text{L}$ indicates severe disease. Lower the platelet count higher the rate of maternal & fetal morbidity & mortality. After delivery platelet count may continue to decline for the first day then progressively reach to normal level within 3 to 5 days. Thus, this study was carried out to assess the value of platelet count as a prognostic indicator in women with raised blood pressure.

II. MATERIAL AND METHODS

The study was carried out in 160 antenatal women attending outpatient department as well as indoor cases of Swaroop Rani Nehru Hospital and Kamala Nehru Memorial Hospital, Department of Obstetrics and Gynaecology, Motilal Nehru Medical College, Prayagraj, over a period of one year from September 2018 to August 2019.

METHOD OF COLLECTION OF DATA

Inclusion criteria:

- Pregnant women beyond 20 weeks of gestation were included and divided into two groups.
- Study group included women with hypertensive disorders of pregnancy and control group included healthy pregnant women with no risk factor.
- Cases was subdivided into mild preeclampsia, severe preeclampsia and eclampsia. Control was selected by consecutive sampling.

Exclusion criteria:

- Thromboembolic episode
- Haemorrhagic disorder
- Epilepsy
- Pre-existing Diabetes Mellitus
- Hypertension in less than 20 weeks
- Drug intake which leads to platelet count and function to get altered.

Every 10th patient in antenatal OPD was selected as control by simple random sampling and cases were further subdivided into mild preeclampsia, severe preeclampsia and eclampsia

Routine antenatal investigations like Blood group/Rh factor, haemoglobin, blood sugar (2 hours after 75 gm of glucose), HIV I and II, VDRL, HCV, HBSAg, fasting sample of S. TSH, Free T3, Free T4 and urine routine and microscopic was done. In women with hypertension additional investigations were done - platelet count, bleeding time clotting time, prothrombin time, activated partial thrombin time, LFT, RFT, Urine for albumin, 24 hr urine for proteins, USG for fetal growth and amount of liquor, fundus examination.

Principle of method: Sample collection - 2 ml of venous blood sample was collected in EDTA (ethylene diamine triacetic acid) vial. The blood is mixed well and the vial placed under automated haematology analyser. Automated haematology analyser work on the principle of electrical impedance. Impedance counting discriminates particles based on their size. As platelets pass singly through an aperture between positive and negative electrodes, passing of the cell reverses the resistance, so a pulse is

generated which is recorded. Each pulse size is proportional to size of platelets. Cells with volume between 2- 30 fl are counted as platelet (average 8- 12 fl). Different cells in the blood component was counted & results was printed. Count was rechecked manually using Leishman's stain method in patients with very low platelet count. Average no of platelets per field was calculated and multiplied by 20,000 to set approximated value in each cubic mm blood manual.

All participants were followed up until delivery and in post-partum period for six weeks for the maternal outcome. Maternal outcome was studied in terms of following:

- Onset of labour – term or preterm
- Mode of delivery
- Antepartum complications like abruptio placentae, HELLP syndrome.
- Post partum complications like primary PPH, secondary PPH, pulmonary edema, DIC, haematoma formation or maternal death.

Fetal outcome was noted in terms of birth weight, and for fetal complications like intrauterine growth restriction, low birth weight, meconium aspiration syndrome, intrauterine death of fetus or any neonatal complication e.g. jaundice/respiratory distress/septicaemia.

Statistical Analysis: Descriptive data was presented in the form of proportions and percentages. Association of various variables with different categories of hypertensive diseases of pregnancy i.e. mild preeclampsia, severe preeclampsia and eclampsia was done with the help of Chi square test, independent sample t test and Pearson coefficient correlation test. Two tailed p value of <0.05 was taken as significant.

Table 1. Systolic blood pressure pattern

Systolic Pressure in Hg	Blood in mm	No. Of Patients	Percentage (%)
100-120		44	27.5
121-140		36	22.5
141-160		25	15.6
161-180		37	23.1
>180		18	11.3
Total		160	100

From above table we observed that in our study group most of the pregnant women 44 (27.5%) out of 160 had systolic blood pressure between 100- 120 mm of mercury, 36 (22.5 %) women had systolic blood pressure between 121- 140 mm of mercury, 25 (15.6%) females had systolic blood pressure

between 141-160mm of mercury, 37 (23.1%) females had systolic blood pressure between 161- 180 mm of mercury and 18 (11.3%) women had systolic blood pressure more than 180 mm of mercury.

Figure 1. Systolic blood pressure pattern

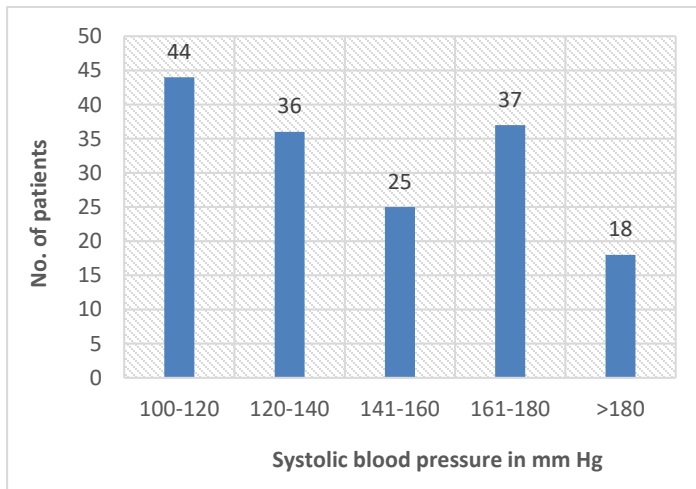


Figure 2. Diastolic blood pressure pattern

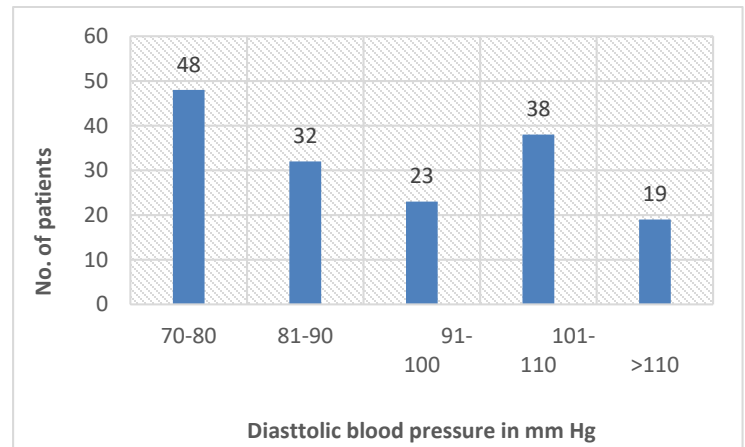


Table 2. Diastolic blood pressure pattern

Diastolic Blood Pressure in mm Hg	No. Of Patients	Percentage (%)
70-80	48	30
81-90	32	20
91-100	23	14.4
101-110	38	23.8
>110	19	11.8
Total	160	100

From above table we observed that in our study group most of the pregnant women 48 (30%) out of 160 had diastolic blood pressure between 70-80 mm of mercury, 32 (20%) women had diastolic blood pressure between 81-90 mm of mercury 23 (14.4%) women had diastolic blood pressure between 91-100 mm of mercury, 38 (23.8%) females had diastolic blood pressure between 101-110 mm of mercury and 19 (11.8%) women had diastolic blood pressure more than 110 mm of mercury. From both tables we observed that mean arterial pressure in study group was 116.30 ± 1.67 mm of mercury as compared to mean arterial blood pressure in control group was 80.62 ± 4.28 mm of mercury. $P < 0.0001$ which is highly significant.

Table 3. Distribution according to platelet count in control and cases

Platelet Count Lac/Mm ³	Group 1		Group 2					
	Control		Mild Pre - Eclampsia		Severe Pre - Eclampsia		Eclampsia	
	Count	%	Count	%	Count	%	Count	%
>1.5	73	91.25	31	77.5	7	28	3	20
1-1.5	7	8.75	7	17.5	13	52	7	46.6
<1	0	0	2	5	5	20	5	33.4
Total	80	100	40	100	25	100	15	100

Table 4. Mean platelet count in control and cases

Group	No. Of Patients	Mean Platelet Count (Lacs/Mm ³)	P Value (Compared to The Control)
Mild Preeclampsia	40	2.39 ± 0.41	< 0.001
Severe Preeclampsia	25	1.08 ± 0.42	<0.001
Eclampsia	15	0.90 ± 0.37	<0.001
Control	80	2.75 ± 0.59	

From the above mentioned table it was observed that:

Out of 80 women in control group 73 (91.25%) patients had platelet count more than 1.5 lac/mm³ while 7 (8.75%) women had platelet count between 1-1.5 lac/mm³. Out of 40 cases with mild preeclampsia 31 (77.55%) cases had platelet count more than 1.5 lac/mm³ while 7 (17.5%) patients had platelet count between 1-1.5 lac/mm³ and only 2 (5%) patients had platelet count less than 1lac/mm³. In severe preeclampsia 7 (28%) patients had platelet count more than 1.5 lac/mm³, 13 (52%) patients had platelet count between 1-1.5 lac/mm³ and 5 (20%) cases had platelet count less than 1lac/mm³. In eclampsia 3 (20%) patients had platelet count more than 1.5 lac/mm³, 7 (46.6%) patients had platelet count between 1-1.5 lac/mm³ and 5 (33.4%) patients had platelet count less than 1lac/mm³. Mean platelet count of control was 2.75 ± 0.59 lac/mm³. Mean platelet count in mild preeclampsia was 2.39 ± 0.41 lac/mm³. Mean platelet count in severe preeclampsia was 1.08 ± 0.42 lac/mm³. Mean platelet count in eclampsia was 0.90 ± 0.37 lac/mm³.

Figure 3. Distribution according to platelet count in control and cases

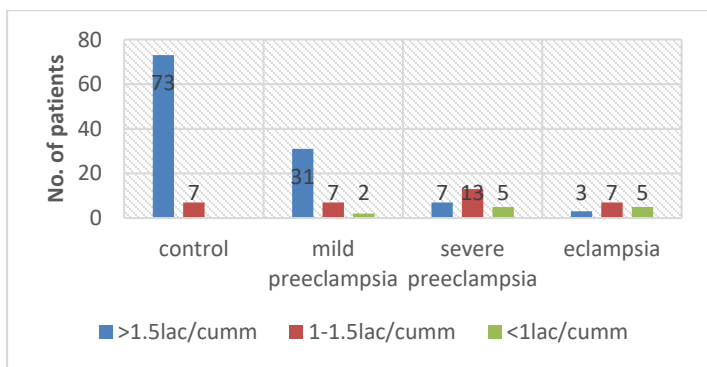


Table 5. Distribution according to mode of delivery in control and cases

Mode Of Delivery	Control		Mild Pre Eclampsia		Severe Pre Eclampsia		Eclampsia	
	Count	%	Count	%	Count	%	Count	%
Vaginal	55	68.75	22	55	7	28	1	6.6
Caesarean	25	31.25	18	45	18	72	14	93.4
Total	80	100	40	100	25	100	15	100

From above Table in control group 55 (68.75%) women delivered vaginally and 25 (31.25%) women delivered by caesarean while in cases 22 (55%), 7 (28%) and 4 (26.6%) patients with mild preeclampsia, severe preeclampsia and eclampsia respectively delivered vaginally and 18 (45%), 18 (72%) and 14 (93.4%) patients with mild preeclampsia, severe preeclampsia and eclampsia respectively delivered by caesarean section.

Figure 4. Distribution according to mode of delivery

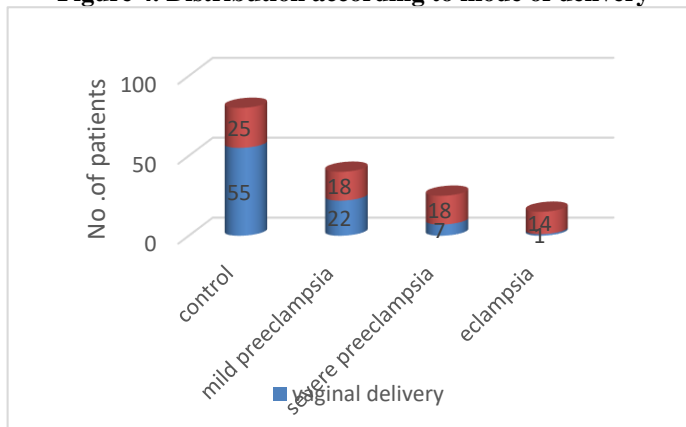


Table 6. Maternal outcome in control and cases

Group	Preterm Labor	Abruptio	DI C	Pulmonary Oedema	PPH	Maternal Death
Mild Preeclampsia N=40	7	0	0	0	0	0
Severe Preeclampsia N=25	18	9	0	0	2	0
Eclampsia N=15	8	1	2	2	1	9
Control N=80	14	0	0	0	0	0
Total N=160	47	10	2	2	3	9

From Table 6 we observed that the most common maternal complication was preterm labor in both group that was 7 out of 40 in mild preeclampsia, 18 out of 25 in severe preeclampsia and 8 out of 15 patients with eclampsia and 14 out of 80 in control group. In severe preeclampsia placental abruption was the second most common complication in 9 patients out of 25 and 2 patients had PPH out of 25 patients. In eclampsia 2 patients each had DIC, pulmonary edema while one patient each undergone PPH, abruption and nine died.

Figure 5. Maternal outcome in control and cases

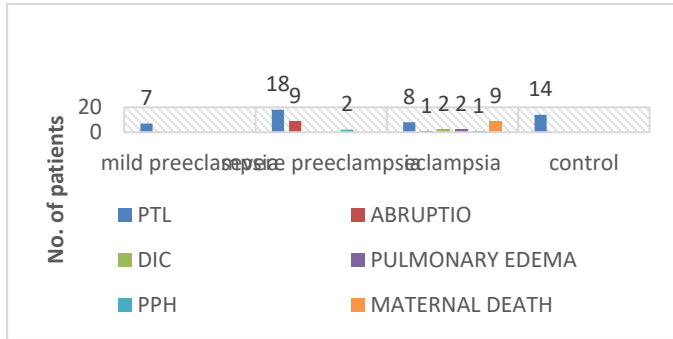


Table 7. Fetal outcome in control and cases

Group	Term	Preterm	IUGR	IUD	MAS	Jaundice	LBW
Mild Preeclampsia N=40	33	7	7	0	3	0	2
Severe Preeclampsia N=25	7	18	19	6	8	0	8
Eclampsia N=15	7	8	2	10	3	2	4
Control N=80	66	14	6	0	0	0	7
Total N=160	113	47	23	10	2	2	3

From above table we observed that 33 (82.5%) patients with mild preeclampsia, 7 (28%) patients each with severe preeclampsia and eclampsia in study group and 66 (82.5%) patients in control group had delivered term babies while rest are preterm babies. The most common fetal complication was IUGR, 7 out of 40 in mild preeclampsia, 19 out of 25 in severe preeclampsia MAS was the second most common complication in 3 out of 40 in mild preeclampsia and LBW was the third most common complication in 2 out of 40 patients. In severe preeclampsia MAS and LBW were the second most common complication seen in 8 patients each out of 25 and 6 patients had IUD out of 25 patients. In eclampsia IUD was most common complication seen in 10 out of 15 patients and 3 out of 15 had MAS, 4 out of 15 had LBW and 2 each out of 15 had jaundice and IUGR. In control group 6 were IUGR and 7 were LBW.

Figure 6. Fetal outcome in control and cases

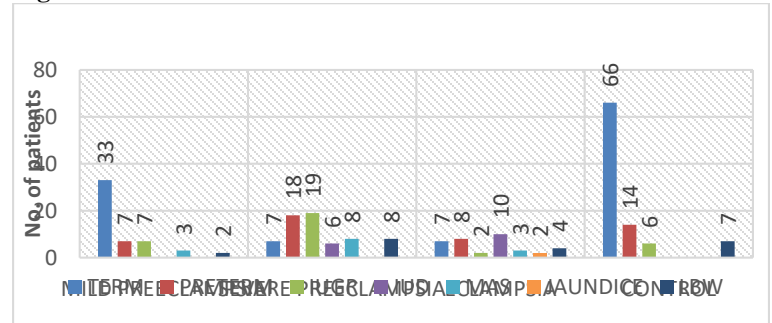


Table 8. Distribution of maternal and fetal complications among cases in relation to the platelet count

Platelet count in lacs/mm ³	Maternal complication	Fetal complication
<1	10(17.2%)	6(9.6%)
1-1.5	28(48.7%)	32(51.6%)
>1.5	20(34.4%)	23(37%)
total	58(100%)	62(100%)

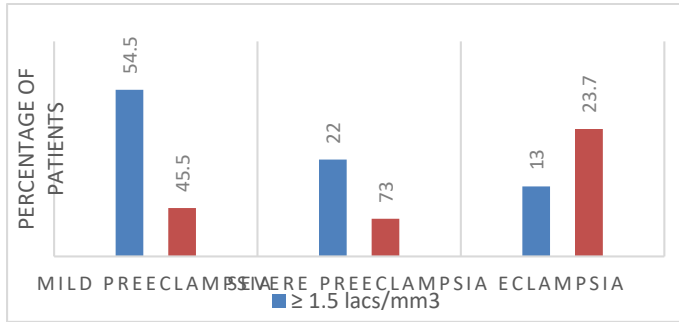
From the above table we observed that out of 80 patients 58 showed maternal complications while 62 showed fetal complications. 28 (48.7%) of the maternal complications and 32 (37%) of fetal complications were seen in cases with platelet count in range of 1-1.5 lacs/mm³ and 10 (17.2%) maternal complications and 6 (9.6%) of fetal complications were seen in cases with platelet count less than 1 lacs/mm³. Maternal and fetal complications often coexisted in the same patient.

Table 9. Association between platelet count and cases

Platelet count	Hypertensive disorders in pregnancy	Statistical analysis
≥ 1.5 lacs/mm ³	32(54.2%) Mild preeclampsia	X ² =6.1684, p=0.045766
< 1.5 lacs/mm ³	13(22.0%) Severe preeclampsia	X ² =6.1684, p=0.045766

From above table we observed that 32 (54.2%) cases with mild preeclampsia were had platelet count more than or equal to 1.5 lacs/mm³. 14 (22.0%) cases with severe preeclampsia had platelet count less than 1.5 lacs/mm³ and this association was found statistically significant on Chi-Square test (X²=6.1684, p=0.045766) at 5% level of significance and 95% confidence interval.

Figure 7. Association between platelet count and cases



III. DISCUSSION

Blood pressure distribution

One of the criteria for severity of preeclampsia and eclampsia is blood pressure, more than 160/110 mm of mercury. In our study only 23 (14%) patients had blood pressure more than 160/110 mm of mercury and rest 137(86%) patients had blood pressure less than 160/110 mm mercury. Mean blood pressure of our study group was 116.30 ± 1.67 mm Hg. (Table-1,2, Figure-1,2)

Platelet count

Out of all hematological abnormalities that occur in hypertensive disorders of pregnancy, thrombocytopenia is the most common. **Sibai BM et al (1996)**⁶. There was progressive fall of mean platelet count with the increasing severity of disease. In present study, it was seen that there was significant decrease in platelet count in preeclampsia and eclampsia patients when compared to control group i.e. normotensive pregnant. Out of 80 patients in control group 73(91.25%) patients had platelet count more than 1.5 lacs/mm³ while 7(8.75%) patients had platelet count between 1-1.5 lacs/mm³. Out of 40 patients with mild preeclampsia 31(77.55%) patients had platelet count more than 1.5 lacs/mm³ while 7(17.5%) patients had platelet count between 1-1.5 lac/mm³ and only 2(5%) patients had platelet count less than 1lac/mm³.

7(28%) patients with severe preeclampsia had platelet count more than 1.5 lac/mm³, 13(52%) patients had platelet count between 1-1.5 lacs/mm³ and 5(20%) had platelet count less than 1lac/mm³. In eclampsia 3(20%) patients had platelet count more than 1.5 lac/mm³, 7(46.6%) patients had platelet count between 1-1.5 lac/mm³ and 5(33.4%) patients had platelet count less than 1lacs/mm³. Mean platelet count of control was 2.75 ± 0.59 lac/mm³ Mean platelet count in mild preeclampsia was 2.39 ± 0.41 lac/mm³ Mean platelet count in severe preeclampsia was 1.08 ± 0.42 lac/mm³ Mean platelet count in eclampsia was 0.90 ± 0.37 lacs/ (table 3,4 and figure 3). The mean platelet counts in both the case and control group was compared with other studies conducted by **Chaware SA et al, Mohapatra S et al, Joshi KV et al.**^{7,8,9} In all the studies including the present one, the mean platelet counts in the control was more than 2.2 lakh/mm³ and it also demonstrated a decreasing trend as the severity of preeclampsia increased even though in most of the studies the mean platelet counts were in the normal range of 1.53 lac/ mm³. But in eclampsia the mean platelet count was seen to be below 1 lac/mm³.

Mode of delivery

Majority of patients 55 (68.75%) delivered vaginally in control group and maximum patients 50 (62.5%) were delivered by caesarean section in study group. Thus, more operative interventions were required in patients of preeclampsia and eclampsia (Table 5, Figure 4)

Fetomaternal outcome

Hypertensive disorders of pregnancy are a leading cause of maternal and perinatal and morbidity worldwide, in India, they account for the third most important cause of maternal mortality (International journal of reproduction, contraception, Obstetrics and Gynecology 2017)¹. In present study we observed that the rate of maternal complications and fetal complications during pregnancy was higher in the cases of severe preeclampsia and eclampsia. In our study incidence of intrauterine growth restriction, low birth weight, preterm, meconium aspiration syndrome and intrauterine death increased as platelet count decreases below 1.5 lacs/mm³

In 80 patients among study group, in mild preeclampsia 7 (17.5%) patients, 18 (72%) patients with severe preeclampsia and 8 (53.3%) with eclampsia underwent preterm labor, 10 cases (12.5%) of placental abruption, 3 (3.75%) went into postpartum hemorrhage, 2 (2.5%) went into DIC, 2 (2.5%) had pulmonary edema and 9 (11.25%) eclamptic patient died. While in control group 14 patients had undergone preterm labor. In study group 33 (82.5%) patients with mild preeclampsia, 7 (28%) patients each with severe preeclampsia and eclampsia and 66 (82.5%) patients in control group delivered term babies while rest were preterm babies. In study group the most common fetal complication was IUGR followed by IUD then LBW. IUGR was present in 7 (8.75%) patients with mild preeclampsia, 19 (23.8%) with severe preeclampsia and 2 (2.5%) with eclampsia and in 6 (7.5%) patients of control group. IUD occurred in 16 (20%) cases with 6 (7.5%) seen in severe preeclampsia patients and 10 (12.5%) in eclampsia. LBW was observed in 2 (2.5%) with mild preeclampsia, 8 (10%) with severe preeclampsia and 4 (5%) eclampsia cases and 7 (8.75%) patients of control group. MAS was observed in 3 (3.25%) mild preeclampsia, 3 (3.25%) severe preeclampsia and 2 (2.5%) eclampsia cases. 6 (7.5%) had fetal complications of IUGR and 7 (8.75%) had LBW in control group. (table 6,7,8 figure 5,6)

In the present study we observed that Out of 80 cases who presented with thrombocytopenia, 33 underwent preterm labor, 10 had placental abruption, 3 had PPH, 2 had DIC, 2 women had pulmonary edema and nine maternal death occurred. Most of the fetal complications were also seen in cases with platelet count in the range of 1-1.5lac/mm³.

IV. CONCLUSION

1. One fourth patients 40 (25%) had systolic blood pressure more than 160 mm of mercury in our study,
2. Less than one fourth patients 23 (14%) had diastolic blood pressure more than 110 mm of mercury.
3. Mean arterial pressure in study group was 116.30 ± 1.67 mm of mercury as compared to mean arterial blood pressure in

control group was 80.62 ± 4.28 mm of mercury which was highly significant ($P < 0.001$).

4.Strong association was found between the platelet count and the severity of preeclampsia and eclampsia. ($P < 0.001$). Moreover thrombocytopenia (platelet count < 1.5 lakh/mm³) was present in a total 80 cases of which 31 had mild preeclampsia, 7 had severe preeclampsia and 12 patient had eclampsia. Thus it can be considered as a reliable prognostic indicator in preeclampsia and eclampsia.

5.Maximum number of patients 55 (68.75%) delivered vaginally in control group and maximum number of patients 50 (62.5%) were delivered by caesarean section in study group. Operative interventions was required in most of cases of preeclampsia and eclampsia.

Most common maternal outcome was preterm labor in both study and control group. Placental abruption was second most common cause in severe preeclampsia and 2 patients of eclampsia had undergone DIC while nine patients died of eclampsia. Thus, risk of maternal complications increases in preeclampsia and eclampsia.

6.Of normotensive pregnant women maximum babies 57 (71.24%) were born at term while 46 (58%) were term babies in preeclampsia and eclampsia.

7.IUGR was the most common fetal complication in study group while LBW was most common fetal complication in control group. IUD was the second most common complication followed by LBW in study group.

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