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A Comparative Study of Coagulation Profile and Haematological Parameters in Pregnancy Induced Hypertension (PIH).

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Aim: To evaluate the changes in PIH (Pregnancy Induced Hypertension) by using haematological and coagulation parameters like platelet count, MPV, PDW, PT and APTT. **Materials and methods**: A total of 150 cases comprising 75 control groups and 75 cases group (pregnancy-induced hypertension) were enrolled in the study. Hematological parameters like platelet count, MPV, PDW and coagulation parameters like PT and APTT were studied in these patients. Data entry was done in an excel spreadsheet and by using SPSS (version -20). **Results:** The hematological parameter - Platelet count was markedly reduced in patients with preeclampsia compared to normal pregnant patients. MPV, PDW, PT and APTT were increased which is statistically significant. **Conclusion**: The abnormalities about hematological and coagulation parameters in preeclampsia are the prognostic markers used as an additional diagnostic criterion for preeclampsia in rural hospitals.

Keywords: Pregnancy-induced hypertension, Platelet count, Prothrombin Time

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Introduction

Pregnancy is a physiological process in women which can be associated with certain risks to the health of both the mother and child. [1]. Hypertension is one of the serious complications seen in 7 to 10% of pregnancies leading to maternal and perinatal mortality and morbidity. [1]. Pregnancy-induced hypertension (PIH) is one of the common disorders associated with high blood pressure that occurs in pregnancy for the first time after 20 weeks of gestation and disappears following delivery [2]. It is commonly seen in primigravida compared to multiparous women. [3]. Eclampsia is a severe form of pregnancy-induced hypertension along with seizures resulting from the condition [4].

Most of these conditions can be prevented and treated by early good antenatal care but the circumstances are not so easy in developing countries due to lack of health facilities. [5,6]. The variety of haematological changes occurs in PIH in that thrombocytopenia is the most common abnormality seen due to increased consumption during low-grade intravascular coagulation [7,8]. This study is undertaken to assess the severity of PIH and coagulopathy related adverse effects by using haematological/coagulation parameters which are rapid, cheaper and easily available, that also guide us for management before the patient goes into a complication.

Materials and methods

The study was conducted in the Department of Pathology Sri Siddhartha Medical college Tumkur in collaboration with the department of OBG. The study was done for a period of one and a half years from Jan 2019 to June 2020. It is a prospective study sampling was done by using a random sampling method. A total of 150 pregnant women attending from OPD. Inclusion criteria: Pregnant women more than 28 weeks gestation of pregnancy with blood pressure >140/90mmhg, with or without edema and proteinuria in urine were included in the study. Exclusion criteria: Thromboembolic episode, Hemorrhagic disorder, Epilepsy, Hepatic or renal disorder, Pre-existing DM, HTN <20weeks, H/O Drug intake. The case group included 75 women with PIH and the control group included 75 healthy pregnant women with no risk factor. Routine antenatal investigations like blood group, CBC, BT, CT, blood sugar, HIV, VDRL, HBsAg were done.

In women with hypertension additional investigation was done are manual platelet counts, peripheral smear, PT, APTT, RFT, LFT, and USG. Sample collection – 5ml of blood sample is collected in an EDTA and sodium citrate vacutainer. Coagulation parameters were carried out by ERBA ECL 412 series coagulometer. Platelet count was estimated by hematology analyzer Sysmex XN-330 and manual method by peripheral blood smear. Ethical clearance -Taken from the institutional ethical committee.

Statistical analysis: Data entry was done in an excel spreadsheet then exported to the SPSS package. Data cleaning and validation were done using SPSS (version -20). An independent sample t-test was used to check for differences in mean parameter values like platelet count, MPV, PDW, PT, APTT between case and control groups. P-value <0.05 was set for statistical significance.

Results

In the present study hematological parameters like platelet count, MPV, PDW, PT and APTT levels were estimated in 75 controls and 75 cases in normotensive and hypertensive pregnant women respectively. Out of 75 cases of pregnancy-induced hypertension 5 were eclampsia, 40 were mild pre-eclampsia and 30 were severe pre-eclampsia cases. The mean and standard deviation of age in control is 28.32 and cases is 28.64, the differences are not statistically significant (Table 1).

Table 1: Mean age of subjects

Group	N	Mean	Std. Deviation	Minimum	Maximum
Control	75	28.32	3.44	22.00	36.00
Cases	75	28.64	1.78	26.00	32.00
Total	150	28.52	2.53	22.00	36.00

The parity of the two groups was not similar. The percentage composition of a primigravida in control is 33 (44%) compared to the case group is 47(62.7%) and multigravida in control is 42 (56%) compared to case group is 28(37.3%) within the group. So primigravida was more common in the case group compared to the control group (Table 2).

Table 2: Distribution of subjects by Gravida

Gravida	Control	Cases	Total
Primi	33 (44%)	47 (62.7%)	80 (56.0%)
Multi	42 (56%)	28 (37.3%)	70 (44.0%)
Total	75 (100%)	75(100%)	150 (100%)

The mean and standard deviation of platelet count (lakhs/cu mm) in control is 2.71(lakhs/cu mm) as compared to 1.52(lakhs/cu mm) in the case group. The mean and standard deviation of mean platelet volume (fl) in control is 8.58(fl) as compared to the 8.84(fl) case group. The mean and standard deviation of platelet distribution width (%) in control is 12.5(%) as compared to the 12.69 (%) case group. The differences were statistically significant as shown in (Table 3).

Table 3: Comparison of parameters between and cases and control

Parameters	Group	N	Mean	Std. Deviation	t-value	p-value
Platelet count	Control	75	2.71	0.55	15.095	<0.001*
	Cases	75	1.52	0.41		
MPV	Control	75	8.58	0.61	2.57	0.011*
	Cases	75	8.84	0.60		
PDW	Control	75	12.50	0.49	2.069	0.040*
	Cases	75	12.69	0.57		
PT	Control	75	12.25	1.12	-16.494	<0.001*
	Cases	75	16.70	1.82		
APTT	Control	75	25.59	3.45	-15.189	<0.001*
	Cases	75	32.73	2.30		

P-values based on independent sample t-test, *Statistically significant at p-value<0.05

The mean and standard deviation of prothrombin time (sec) in control is 12.25(sec) as compared to the 16.70(sec) case group. The mean and standard deviation of Activated partial thromboplastin time (sec) in control is 25.59 (sec) as compared to the 32.73(sec) case group. The differences were statistically significant as shown in (Table 3).

Discussion

Patients with Pregnancy-induced hypertension may develop a variety of haematological changes, among all haematological changes, thrombocytopenia is the most common abnormality seen. Thrombocytopenia is common in the third trimester due to hemodilution, increased platelet consumption, increased platelet aggregation by increased levels of thromboxane A2.

In pre-eclampsia there is endothelial dysfunction which will lead to an altered level of fibrinogen, activated partial thromboplastin time, prothrombin time, fibrin degradation products and D-dimers. The present study shows pregnancy is associated with many complicated changes which are not clearly understood involving blood coagulopathy. [1].

Among 75 cases of pregnancy-induced hypertension, 62.7% of them were primigravida. A higher incidence of preeclampsia in primigravida has been reported by Xiong et al; the incidence of preeclampsia was markedly lower in multiparous women who previously delivered at term (0.9%) as compared to the incidence in primigravida women. [9]. The present study demonstrated a mean platelet count of 2.71 in the control group and in the case group 1.52 which was statistically significant. The study by Halder et al showed platelet count 2.1Lakh/cumm in the control group in mild pregnancy-induced hypertension 1.82 lakh/cumm and 1.21lakh /cumm in eclampsia. [10].

Their findings are in concordance with the findings of our study. Sharma et al in his study showed a decrease in mean platelet count 2.05lakhs/cumm in mild preeclampsia, 1.32lakhs/cumm in severe preeclampsia cases and 1.03lakhs/cumm in eclampsia. The platelet count decreased significantly with an increase in the severity of preeclampsia. [11]. In a study conducted by sultan R et al on platelet count in cases and controls were 1.44lakhs/cumm and 1.98 lakhs /cumm respectively. The study revealed that low platelet count is associated with pre-eclampsia. [12]. A similar study was done by many authors like, Leduc l et al [13]. shete et al [14]. showed a decrease in mean platelet count in the study group compared to the control group.

The study showed increased mean platelet volume (fl) in the control group is 8.58(fl) as compared to the 8.84(fl) cases group. Similarly platelet distribution width is also increased in control is 12.5(%) as compared to 12.69 (%) case group. The difference is statistically significant compared with similar studies done by different authors like Dadhich S et al [15]. also showed increased mean platelet volume (MPV) 10.83fl and platelet distribution width (PDW) 14.81 compared to normotensive patients. Khan M N et al showed increased MPV 9.78 and PDW 12.4 compared to normotensive. Also the rise in PDW and MPV was observed before the significant rise in blood pressure. [16].

The study showed increased prothrombin time (sec) in the cases group is 16.70(sec) as compared to the 12.25(sec) control group. Also there was an increase in Activated partial thromboplastin time (sec) in cases group is 32. 75 (sec) as compared to 25.59(sec) control group. The difference was statistically significant.

The findings were in concordance with the study done by Lakshmi et al shows increased prothrombin time (PT) and activated partial thromboplastin time (APTT) in severe preeclampsia and eclampsia. [17]. The study done by Joshi SR et al shows thrombocytopenia and coagulation abnormalities particularly showing an increase in APTT.[18]. So the present study demonstrated that coagulation parameters were the prognostic markers in predicting the severity of preeclampsia. In Swetha et al, a significant decline in total platelet count (TPC), increase in prothrombin time, activated partial thromboplastin time, bleeding time, and clotting time was seen in PIH as compared to normal pregnancy.

NLR (Neutrophil lymphocytes ratio) is also significantly raised in PIH. TPC and NLR estimation can be taken as an early and rapid procedure for screening preeclampsia cases at admission followed by serial platelet counts while monitoring coagulation indices.[19]. In Mishra et al, in their study preeclampsia and eclampsia, decrease in platelet count (1.69±0.53 lacs/cumm) compared to the control group was statistically significant (p= 0.000) and increase in PT (12.5 ± 1.17 sec) and aPTT (30.5 ± 2.29 sec) were significant ($p<0.05$).

Platelet count is inversely proportional to the severity of PIH and the risk of coagulopathy increases with worsening thrombocytopenia. There are no cases with normal platelet count where PT or aPTT were prolonged.[20]. Chauhan et al, in their comparative study of coagulation profile in preeclamptic, eclamptic and normotensive patients found that PT was 13.78 seconds in mild.13.8 seconds in severe preëclampsia and 14.1 seconds in normal. However in his study, the increase in prothrombin time was not statistically significant. [21].

No screening test would help in identifying which pregnancy is associated with pregnancy-induced hypertension or assess its severity. Early assessment is necessary to prevent complications and mortality and morbidity. Hence this study is undertaken to assess the severity of PIH and coagulopathy by a method of rapid, cheaper and easily available so that they will guide us for management before the patient goes into a complication. The present study concludes platelet count is one of the useful predictors, rapid, reliable, low cost and easily available routine screening test for coagulopathy in PIH even in rural areas.

Our study revealed that PT and APTT are prolonged in pregnancy-induced hypertension and normal in the control group. Coagulation parameters PT and APTT were thus established as the prognostic markers in predicting the severity of preeclampsia.

Conclusion

Patients with pregnancy-induced hypertension show a marked reduction in platelet count with an increase in mean platelet volume and platelet distribution width. Also coagulation parameters like PT and APTT were significantly increased in PIH. These parameters are sensitive and specific prognostic markers that can be used as early intervention in detecting patients developing PIH. The prognostic markers are reliable, rapid, easily available and used as an additional diagnostic criterion for preeclampsia in rural hospitals. Our study concludes that haematological and coagulation parameters were established as the prognostic markers in predicting the severity of preeclampsia and also a diagnostic tool in rural hospitals to reduce the morbidity and mortality due to PIH.

Contributors

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