ORIGINAL RESEARCH

A prospective study of coagulation profile in patients of pregnancy induced hypertension

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ABSTRACT

Introduction: The most common disorders that are associated with pregnancy are Eclampsia. Hypertensive disorders of pregnancy affect about 10% of all pregnant women globally. The prevalence of Pregnancy Induced Hypertension in India ranges from 5 - 8%. Hypertensive disorders of pregnancy are the frequent cause of severe acute morbidity, long term disability and death among pregnant mothers and babies.Abnormal coagulation of blood can be a cause of frequent haemorrhages in women. There is a strong association between the two most important causes of maternal mortality and morbidity globally such as Preeclampsia and Postpartum haemorrhage. Recently, there is no observable screening test that would help in identifying which pregnancy will be affected with PIH or assess its severity.Hypertension prior to 20 weeks gestation is almost always is due to chronic hypertension; preeclampsia is rare prior to the third trimester.[5] Hence this study was done to study the platelet and coagulation abnormalities occurring in patients of PIH including platelet count, PT and APTT parameters.

Materials and Methodology:A prospective comparative study was undertaken which include 110 females with uncomplicated pregnancy and 110 females with pregnancy induced hypertension reported in the Department of Obstetrics and Gynaecology and the time duration of the study was stipulated to be around one year. All the participants who were included in the study were divided into two groups. Control Group - this group comprised of pregnant women in 3rd trimester with normal blood pressure, no proteinuria or oedema. Study Group - this group enclosed of pregnant women whose blood pressure at or above 140/90 mm of Hg on at least two occasions, six or more hours apart in 3rd trimester of the current pregnancy together with or without proteinuria, oedema, convulsions and coma. Study group was further classified into gestational hypertension (GH), preeclampsia: mild (MP), severe (SP) and eclampsia (E) based on their presentation. Platelet count was evaluated by automated cell counter whereas PT and APTT were done on fully automated Stago STA Compact. All statistical analysis was done by using graph pad and SPSS trial version 22 software.

Results:A total of 220 pregnant females were included in the study, out of which 110 were included in the control group and 110 were in study group. Maximum number of cases in both the groups, control and study group are observed mostly between 18 to 29

years of age.In the present study, PIH was more commonly associated in primipara. Mean values of platelet count, PT and APPT of control and study group and individual group are tabulated in table 3 and 4. Mean values of PT and APTT fall from normal reference range in all groups, but when compared with increasing grade of severity it depicts gradual increase. Decrease in platelet count is statistically significant ($p<0.001$). There is statistically significant increase in PT ($p<0.001$) and APTT ($p<0.001$) when compared between study and control group using unpaired T test (table 3).

Conclusion:From the study, it has been concluded that decrease in platelet count starts from PIH and it is significantly reduced in preeclampsia and eclampsia patients when compared to normotensive patients having thrombocytopenia where-in platelet count <1.5 lac/mm^3). Also, there is significant increase in mean platelet volume and platelet distribution width in preeclamptic and eclamptic patients. Study of Coagulation profile showed coagulation abnormalities in women with preeclampsia and eclampsia who were reportedly having higher prothrombin time and Activated Partial Thromboplastin Time than control groups. Thus, authors have come to the conclusion that platelet indices and coagulation profile can be used as a reliable early indicator of onset and severity of preeclampsia and eclampsia. These are routine tests which can be performed in every government hospital and can help to reduce the maternal and foetal morbidity and mortality associated with pregnancy induced hypertension.

Keywords: gestational hypertension, primigravida, thrombocytopenia, haemorrhages

INTRODUCTION

The most common disorders that are associated with pregnancy are Eclampsia. Hypertensive disorders of pregnancy affect about 10% of all pregnant women globally.[1,2] The prevalence of Pregnancy Induced Hypertension in India ranges from 5 - 8%. Hypertensive disorders of pregnancy are the frequent cause of severe acute morbidity, long term disability and death among pregnant mothers and babies. Since most of these conditions can be prevented well before its onset or could be treated if identified early by good antenatal care set up; the situation is still not very bright in India. A variety of haematological abnormalities mightaffect the women with PIH. Out of all the haematological changes that occur in preeclampsia and eclampsia, thrombocytopenia is the most common abnormality found. There is also a definite exaggeration of the hypercoagulable state of pregnancy during the onset of eclampsia.

Abnormal coagulation of blood can be a cause of frequent haemorrhages in women. There is a strong association between the two most important causes of maternal mortality and morbidity globally such as Preeclampsia and Postpartum haemorrhage.[3]Recently, there is no observable screening test that would help in identifying which pregnancy will be affected with PIH or assess its severity.[4] This study was to find out the variations that take place in the coagulation profile and platelet indices in PIHwhen compared to that in normal pregnancy. The study was done to see if platelet indices and coagulation profile can be used as a reliable indicator to identify the onset and severity of Pre-eclampsia and eclampsia.

Hypertension prior to 20 weeks gestation is almost always is due to chronic hypertension; preeclampsia is rare prior to the third trimester.[5]hence this study was done to study the platelet and coagulation abnormalities occurring in patients of PIH including platelet count, PT and APTT parameters.

MATERIALS AND METHODS

A prospective comparative study was undertaken which include 110 females with uncomplicated pregnancy and 110 females with pregnancy induced hypertension reported in the Department of Obstetrics and Gynaecology and the time duration of the study was

stipulated to be around one year. All the participants who were included in the study were divided into two groups. Control Group - this group comprised of pregnant women in 3rd trimester with normal blood pressure, no proteinuria or oedema. Study Group -this group enclosed of pregnant women whose blood pressure at or above 140/90 mm of Hg on at least two occasions, six or more hours apart in 3rd trimester of the current pregnancy together with or without proteinuria, oedema, convulsions and coma. Study group was further classified into gestational hypertension (GH), preeclampsia: mild (MP), severe (SP) and eclampsia (E)based on their presentation. Platelet count was evaluated by automated cell counter whereas PT and APTT were done on fully automated Stago STA Compact. All statistical analysis was done by using graph pad and SPSS trial version 22 software.

RESULTS

A total of220pregnant females were included in the study, out of which 110 were included in the control group and 110 were in study group. Distribution of the study participants according to age and diagnosis as follows.

Table 1: Distribution of cases according to age and diagnosis

Age	Control group (n=110)	Study group (n=110)	GHT (19)	MP (41)	SP (40)	E (10)
18 – 23	29	36	3	18	11	5
24 – 29	54	49	10	18	17	5
30 – 35	25	21	4	4	12	0
>35	2	4	2	1	0	0
Total	110	110	19	41	40	10

[GHT=gestational hypertension; MP=mild preeclampsia; SP=severe preeclampsia; E=eclampsia]

Maximum number of cases in both the groups, control and study group are observed mostly between 18 to 29 years of age.

Table 2: Distribution of cases according to parity

Parity	Control group %	Study group %
Primipara	45	66
Multipara	55	34

In the present study, PIH was more commonly associated in primipara. Mean values of platelet count, PT and APPT of control and study group and individual group are tabulated in table 3 and 4. Mean values of PT and APTT fall from normal reference range in all groups, but when compared with increasing grade of severity it depicts gradual increase. Decrease in platelet count is statistically significant ($p<0.001$). There is statistically significant increase in PT ($p<0.001$) and APTT ($p<0.001$) when compared between study and control group using unpaired T test (table 3).

Table 3: Comparison of platelet count, PT and APTT between control and overall values of study group

	Control group	Study group	P – value
Platelet count (lac/mm^3)	3.13± 2.51	1.95±0.86	<0.001
PT (seconds)	12.75±0.98	15.22±5.12	<0.001
APTT (seconds)	26.61±1.92	31.33±5.06	<0.001

Table 4: Mean values of platelet count, PT and APTT with individual categories of study group.

	Control group	GHT (group 1)	MP (group 2)	SP (group 3)	E (group 4)
Platelet count (lac/mm^3)	3.14± 2.51	2.73±0.48	2.39±0.55	1.32±0.74	0.88±0.46
PT (seconds)	12.75±0.98	13.76±0.73	14.29±0.99	16.62±3.62	16.86±2.17
APTT (seconds)	26.61±1.86	28.88±1.57	29.46±1.95	32.49±5.01	40.10±9.07

Table 5: Comparison of platelet count, PT and APTT of control with each group and between each study group

	Platelet count (p - value)	PT (p - value)	APTT (p - value)
Control vs GHT	>0.05	<0.05	<0.05
Control vs MP	<0.05	<0.05	<0.05
Control vs SP	<0.05	<0.05	<0.05
Control vs E	<0.05	<0.05	<0.05
GHT vs MP	>0.05	>0.05	>0.05
MP vs SP	<0.05	<0.05	<0.05
SP vs E	<0.05	>0.05	<0.05
GHT vs E	<0.05	<0.05	<0.05

In table 5, the observed results are statistically significant when p<0.05. When coagulation parameters were compared between control group and each study group significant difference between all parameters was observed except the platelet count which showed no significant decrease in gestational hypertension as compared with control. Unpaired t test and Mann Whitney tests were applied. When coagulation parameters were evaluated in patients of PIH with increasing severity platelet count showed significant decrease with increasing severity except between gestational hypertension and mild preeclampsia.PT and APTT showed significant increase when compared between gestational hypertension and eclampsia but showed variable results between the other 2 subgroups as per ANOVA test by Bonferroni using SPSS trial version 22 software. (No 5 to 8).

Table 6: Degree of thrombocytopenia in the individual categories

Platelet count (lacs/mm^3)	Control group (n=110)	Study group (n=110)	GHT (19)	MP (41)	SP (40)	E (10)
<0.5	0	11	0	0	9	2
0.5 – 1	0	13	0	0	11	3
1 – 1.5	2	13	1	4	4	5
>1.5	108	73	18	37	16	0

Number of cases with low platelet count show increase with increasing severity of the PIH as shown in table 6. PT was prolonged only when platelet count has gone below 1 lac and APTT was prolonged only with platelet count is at<0.5 lac.

DISCUSSION

The findings obtained from the present study (64%) and many other studies such as Leduc et al[6] (65%) and Naaz A et al[7](60%), also prove the fact that PIH ismore prevalent in primigravida. Mostnumber of cases wasobserved between 18 to 29 years of age which is comparable with the studies conducted by ShivkumarS[8], Prakash J[9], Priyadarshini G[10], Nirmala T[11] and LakshmiCV.[12]Occurrence of PIH in young pregnant mothers is obviously due to the fact associated with the early age of marriage and first pregnancy in India

whencompared to western countries. There was steep decline in mean platelet count with increasing severity of PIH observed in present study. Reduction in platelet count can be attributed to platelet activation, platelet aggregation and platelet consumption which can be present during and even before the onset of disease. Platelet activation may lead to increase degeneration of thromboxane A2 and serotonin release which in turn increase vasoconstriction and platelet aggregation.

Even though the mean values of PT and APTT in each group were within normal range there was statistical difference between the values of case and control. 31% of total thrombocytopenia cases were observed in the present study and 24.54% in study performed byJoshi SR.[13]Also, gestational hypertension group showed no patient reported to have thrombocytopenia. All cases with platelet countless than 1.0 lac/mm^3 belong to the subgroup ofsevere preeclampsia and eclampsia group. Leduc et al[6] observed thrombocytopenia in 20% cases of severe preeclampsia, Metz et al[14] observed thrombocytopenia in 4% and almost 7% cases of mild and severe preeclampsia respectively, Mary pat Fitzgerald et al[15] reported that thrombocytopenia resulted in the range from 11-29%in preeclampsia and Mbanya et al[16] reported 8.9% prevalence of thrombocytopenia in preeclampsia. No cases had prolonged PT or APTT in control group in present study. Among study group, 13cases had prolongation of PT and 3 cases had prolongation of APTT. It was observed that prolongation of PT or APTT was never seen with normal platelet count. Out of 13 PT cases 5 had platelet count between 1-1.5 lac while remaining 8 had<0.5lac platelet count whereas all 3 cases of prolonged APTT had thrombocytopenia with a p-value of <0.05 in the present study. Similar findings were published by Leduc L[6], Sharma K[8], Priyadarshini G[10], Nirmal T[11], S Mohapatra[17], Metz J[14] and FitzGerald MP[15]. However, majority of cases of low platelet count had PT and APTT within normal range.

Leduc L[6]conducted a study where-in they concluded that when monitoring intrapartum coagulation indices in preeclampsia, one can safely follow only the platelet count at admission and subsequently, reserving PT and aPTT and fibrinogen levels for those cases complicated by counts less than 100,000/microL. Their conclusion cannot be correlated with the findings observed in this study as authors found PT and aPTT to be equally important.

In a Study conducted by Mohapathra S[17], platelet numbers were found to be around 2.38 lacs/mm3±0.33 in control group, 2.23 lacs/mm3±0.19 in mild PIH, 1.82 lacs/mm3±0.45 in pre-eclampsia and 1.21 lacs/mm3±0.49 in eclampsia. They indicated that there was an inverse relationship between the severity of PIH and platelet numbers. So, they concluded that platelet evaluation is useful as a rapid method of assessingthe PIH even in rural hospital settings. Their findings corroborated with the findings in this study.

CONCLUSION

From the study, it has been concluded that decrease in platelet count starts from PIH and it is significantly reduced in preeclampsia and eclampsia patients when compared to normotensive patients having thrombocytopenia where-in platelet count<1.5 lac/mm^3). Also, there is significant increase in mean platelet volume and platelet distribution width in preeclamptic and eclamptic patients. Study of Coagulation profile showed coagulation abnormalities in women with preeclampsia and eclampsia who were reportedly having higher prothrombin time and Activated Partial Thromboplastin Time than control groups. Thus, authors have come to the conclusion that platelet indices and coagulation profile can be used as a reliable early indicator of onset and severity of preeclampsia and eclampsia. These are routine tests which can be performed in every government hospital and can help to reduce the maternal and foetal morbidity and mortality associated with pregnancy induced hypertension.

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