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Study on coagulation profile in women with pregnancy-induced hypertension in South Indian population

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ABSTRACT

Background: Pregnancy-induced hypertension (PIH) complicates about 6–10% of pregnancies around the world. According to the WHO, PIH is one of the leading causes of maternal, fetal, and neonatal mortality and morbidity. PIH causes many hematological aberrations in women and any abnormalities in the coagulation of blood lead to hemorrhages. **Aims and Objectives:** The objectives of this study were as follows: 1. To study the coagulation profile which includes platelet count, bleeding time (BT), clotting time, prothrombin time, and activated partial thromboplastin time (aPTT) in PIH patients. 2. To compare the above parameters between the normal pregnant subjects and pregnancy-induced hypertensive patients. 3. To compare the above parameters between preeclampsia (PE) and eclampsia patients. **Materials and Methods:** A cross-sectional study was conducted on 120 pregnant women. Among them, 60 patients (Cases) who were diagnosed with PIH, and another 60 (controls) having age and anthropometrically-matched healthy pregnant women were taken as control. Their coagulation profile, which includes total platelet count (TPC), prothrombin time (PT), aPTT coagulation time (CT), and BT were studied. The parameters were compared using Student's t-test. **Results:** There was a significantly lower TPC, and increased PT, aPTT, CT, and BT in women with PIH when compared to normal pregnant women. However, there was no significant difference between women with PE and eclampsia. **Conclusion:** The present study shows significant changes in coagulation profile in women with PIH.

Key words: Coagulation profile; Eclampsia; Preeclampsia; Pregnancy-induced hypertension

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INTRODUCTION

Pregnancy-induced hypertension (PIH) is defined as hypertension (systolic blood pressure [SBP] ≥140 mmHg and diastolic blood pressure [DBP] ≥90 mmHg) that occurs during pregnancy for the 1st time after 20 weeks of gestation. PIH according to the Canadian Hypertension Society can be classified as (a) pre-existing hypertension, (b) gestational hypertension and preeclampsia (PE), (c) pre-existing hypertension plus superimposed gestational hypertension with proteinuria, and (d) unclassifiable hypertension.[1] PE is BP ≥140 mmHg systolic or ≥90 mmHg diastolic with proteinuria (>300 mg/24 h) after 20 weeks gestation, eclampsia is PE with seizures.[2] According to the WHO, PIH is one of the leading causes of maternal, fetal, and neonatal mortality and morbidity.[3] PIH complicates about 6–10% of pregnancies around the world,[4] in India, the condition is no different, a study conducted by Khumanthem et al.,[5] found out that in India, every third cause of maternal death was PIH and in Europe, it was the leading cause of maternal death.[4] PIH causes many hematological aberrations in women,[6] and any abnormalities in the coagulation of blood lead to hemorrhages. There are not many conducted in India let alone in south India, Thus, this study was designed to study the hematological aberrations in women with PIH in south India and also compare the parameter with the severity of the disease.

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Aims and objectives

The objectives of this study were as follows:

1. To study the coagulation profile which includes platelet count, bleeding time (BT), clotting time (CT), prothrombin time (PT), and activated partial thromboplastin time (aPTT) in PIH patients
2. To compare the above parameters between normal pregnant subjects and pregnancy-induced hypertensive patients
3. To compare the above parameters between PE and eclampsia patients.

MATERIALS AND METHODS

Study design and set-up

The present study was carried out in the department of OBG SSMC and RC, Tumkur, during the period from December 2021 to March 2022. Ethical clearance was obtained from the ethical committee of SSMC and RC, Tumkur. After explaining the importance of the procedure to the subjects and the guardians, informed consent was obtained from the subjects.

Inclusion criteria

The following criteria were included in the study:

1. Pregnant women with pre-eclampsia and eclampsia
2. Age and anthropometrically-matched normotensive pregnant women.

Table 1: Details of the study population

Parameter	Control mean±SD	Subjects mean±SD
Age (years)	24±3.3	23.98±1.42
Period of gestation (days)	270.2±11.4	260.02±3.47
SBP (mmHg)	112±12.4	165.73±19.9
DBP (mmHg)	74.6±5.70	110.63±4.79

SBP: Systolic blood pressure, DBP: Diastolic blood pressure

Exclusion criteria

The following criteria were excluded from the study:

1. Pre-existing medical disorders – diabetes mellitus, renal disease, any coagulopathies
2. Smokers, alcoholics
3. Multifetal gestation
4. Placental abruptio or previa
5. Medication (except multivitamins, iron, and calcium), which affects the present study.

Study subjects

The present study included 120 subjects, and the subjects who matched the inclusion criteria were selected by a simple random sampling method. Subjects were divided into 60 patients (Cases) who were diagnosed with PIH another 60 (controls) having age and anthropometrically matched healthy pregnant women were taken as control. These cases were, further, categorized into two groups:

- Group A – pre-eclampsia: BP ≥140 mmHg systolic or ≥90 mmHg diastolic with proteinuria (>300 mg/24 h)
- Group B – eclampsia: pre-eclampsia associated with seizures.

The following coagulation profile was done:
Total platelet count (TPC) – Direct method using Rees-Ecker fluid.

- PT – autoanalyzer
- aPTT – autoanalyzer
- BT – Duke's Method.
- CT – Capillary tube method of Wright.

Statistical analysis

Data were entered in a Microsoft Excel sheet and analyzed using EpiData Analysis V2.2.2.182. All data were expressed as Mean±SD. Student's t-test was also calculated

Table 2: Coagulation profile of subjects and controls

Parameter	Controls (n=60) mean±SD	Subjects (n=60) mean±SD	95% CI	Df	t-value	P-value
Total platelet count (lakh cells/μL)	2.07±0.40	1.07±0.22	0.88–1.11	118	16.96	0.0001
Prothrombin time (seconds)	13.10±0.93	15.31±1.13	−2.58–−1.83	118	11.69	0.0001
Activated partial thromboplastin time (seconds)	29.40±2.28	35.20±4.85	−7.17–−4.42	118	8.38	0.0001
Clotting time (minutes)	4.57±0.56	5.88±1.12	−1.63–−0.98	118	8.10	0.0001
Bleeding time (minutes)	2.62±0.71	4.56±0.75	−2.20–−1.67	118	14.55	0.0001

Table 3: Coagulation profile of preeclampsia and eclampsia subjects

Parameter	Preeclampsia n=30 mean±SD	Eclampsia n=30 mean±SD	95% CI	Df	t-value	P-value
Total platelet count (lakh cells/μL)	1.12±0.18	1.02±0.10	0.02–0.17	58	2.66	0.0101
Prothrombin time (seconds)	15.42±1.01	15.35±1.16	−0.49–0.63	58	0.24	0.8040
Activated partial thromboplastin time (seconds)	36.21±4.64	37.39±3.52	−3.30–0.94	58	1.10	0.2717
Clotting time (minutes)	6.15±0.95	6.62±1.12	−1.00–0.06	58	1.75	0.0849
Bleeding time (minutes)	4.60±0.53	4.79±0.30	−0.41–0.03	58	1.70	0.0928

for statistical significance and P<0.05 was considered significant.

RESULTS

In this study, the coagulation profile in subjects (PIH) was compared with age and anthropometrically-matched controls (Table 1). The mean age and period of gestation of the controls and the subjects were almost same. There is an increase in systolic blood pressure and diastolic blood pressure in subjects when compared to controls.

Table 2 narrates coagulation profile of subjects and controls. There is a significant decrease in the Total platelet count (lakh cells/μL) in subjects compared to controls. Prothrombin time and Activated partial thromboplastin time were increased significantly in subjects compared to controls. There was a significant increase in the Clotting time and Bleeding time in subjects compared to controls (Table 2).

Table 3 shows coagulation profile of preeclampsia and eclampsia subjects their coagulation profile showed as follows, there was a significantly lower TPC, and increased PT, aPTT, CT, and BT in women with PIH when compared to normal pregnant women. However, there was no significant difference between women with preeclampsia and eclampsia (Table 3).

DISCUSSION

Pre-eclampsia is a multisystem disorder of unknown etiology, where women usually develop raised blood pressure and proteinuria, the condition is also associated with abnormalities of the coagulation system, disturbed liver function, renal failure, and cerebral ischemia.[7] PE can progress to Eclampsia, which is often a serious and life-threatening condition for the mother and the baby.[8]

In the present study, we observed that the TPC in the subjects was significantly lower when compared to the control group, this was in line with the observation made by Sultana et al.,[9] Fay et al., also had a similar observation, which they suggested could be due hemodilution, increased platelet consumption, and increased platelet aggregation driven by increased levels of thromboxane A_2.[10] In another study, they concluded that the decreased platelet count could be attributed to increased platelet activation, enhanced aggregation, and destruction which appears to be due to endothelial damage.[11] However, when we compared PE and eclampsia subjects that we did not observe any significant difference. The PT in PIH was significantly prolonged when compared to the control group, they were similar observations Table 2.[12] However, when compared with PE and eclampsia subjects, we did not observe any significant difference. aPTT in PIH was significantly prolonged when compared to the control group, and similar observations were observed Table 3.[13,14] CT and BT, in the present study, were significantly prolonged when compared to the control group, some studies also had similar observations,[15] and the prolonged BT may be due to generalized vasoconstriction. Prolonged CT was due to depression of fibrinolytic activity, but some studies showed otherwise.[16,17] However, when we compared Aptt, BT, and CT with PE and eclampsia subjects that we did not observe any significant difference.

Limitations of the study

The study was conducted on the population in Tumkur city; hence, results cannot be generalized to the entire country. We recommend the study be conducted at different centers.

CONCLUSION

The present study shows significant changes in coagulation profile in women with PIH. Hence, coagulation profile can be used as a screening test for PIH. We can use the coagulation profile in the early detection and prevention of complications in PIH.

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AS- Concept and design of the study, prepared first draft of manuscript; **LMR, S-** Interpreted the results; reviewed the literature and manuscript preparation; **PG-** Concept, coordination, statistical analysis and interpretation, preparation of manuscript and revision of the manuscript.

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