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Original Research Article

Prevention is Better than Cure: A Study of Platelets, CRP Predisposing to Preeclampsia in Healthy Antenatal Women

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Abstract:

Introduction: The need for safe motherhood is one of the criterions for good MCH practices. The normal pregnancy may land up in a complication if not anticipated at early stages and may have a bad perinatal, maternal outcome. One such pathophysiology which can disturb the pregnancy is pre-eclampsia. Platelets play a vital role in response to the hypoxic insult at the uteroplacental junction by initiating coagulation cascade. The pro inflammatory trigger also increase the CRP levels in response to the signals caused by oxygen insufficiency at the vascular endothelium. Thus analysing the parameters in relation to platelet indices, CRP may be useful in prevention of adverse pregnancy outcomes.

Aims and Objectives: To study the platelet indices and Hs- CRP levels in healthy antenatal women. To explore any correlation of altered platelet indices, Hs CRP in pregnancies with preeclampsia.

Materials and Methods: Healthy antenatal women at 11-14 weeks GA were recruited and followed up till delivery. Blood investigations of platelet count, PDW, PCT, Hs-CRP were taken at the time of beginning of study. Then they were followed up till 28-30 weeks watching for onset of PE according to ACOG guidelines, later followed till delivery of the fetus. Unpaired t test was used to study the significance of the variations of the parameters to females who developed pre- eclampsia.

Results: A statistically significant mean difference was observed between cases and controls in platelet count, platelet distribution width .The levels of HS-CRP also had a significant difference in the patients who developed pre-eclampsia when compared to normotensives.

Conclusion: Screening of antenatal women for pre-eclampsia can be postulated by platelet indices, Hs-CRP as a cost effective tool for prevention of adverse maternal, perinatal outcomes.

Keywords: Preeclampsia, Platelet count, PDW, Hs-CRP, Ante Natal Women.

Introduction

Pregnancy is a normal physiological process in female reproductive age group which is a blessing for procreation. Sadly, few of them get complicated with poorly understood mechanism such as in PE. World Health Organization (WHO) estimated that the incidence of PE is higher in developing countries than in developed countries [1].A probable vascular endothelial injury has been attributed as the major cause of PE.

A deficient trophoblastic invasion of maternal vascular bed that causes compromised utero placental flow and initiates oxidative damage, releasing pro-inflammatory cytokines, and anti-angiogenic factors into the maternal circulation that contribute to the endothelial damage. The spark of coagulation mechanisms stimulated there by results in activation of platelets, adherence and agglutination. This in turn causes consumption of the platelets and thus triggers thrombopoiesis. Many studies have explored into coagulation dysfunction of pre eclampsia patients.

Some platelet indices like platelet count, mean platelet volume, PC:MPV ratio, PDW,PCT were used as parameters to study their relationships and onset of PE and prognosis of the mother and the fetus.

Aims and Objectives: To study the platelet indices and Hs- CRP levels in healthy antenatal women.
To explore any correlation of altered platelet indices, Hs CRP in pregnancies with preeclampsia.

Materials and Methods

This was an observational cross sectional study, conducted from March to December in 2021 among 250 healthy pregnant women of age 18 to 35 years who attended the outpatient department of obstetrics and gynaecology, after obtaining institutional ethical clearance. A prior informed written consent was taken from all the participants before enrolling into the study. Demographic data from all the antenatal patients was collected on paper. The routine parameters tested by collecting blood sample, urine samples were collected from pregnant ladies with GA 11 -14 weeks on ultrasound scan. Implying the guidelines of ACOG at 20 weeks GA, new onset hypertension with systolic blood pressure ≥140 mmHg or diastolic blood pressure ≥90 mmHg, proteinuria of >0.3 g/24 h or ≥1+ proteinuria, detected by urine dipstick test, in the absence of proteinuria.

Anthropometric measurements such as height in centimetres, weight in kilograms and body mass index (BMI) were recorded. Blood pressure was measured with a sphygmomanometer, on the right hand of the subject in seating position, for 3 readings and a highest value by mercury sphygmomanometer non-fasting, diurnal random venous blood sample was drawn for HS-CRP estimation and an additional 2ml of blood was collected in ethylene di-amine tetra acetic acid (EDTA) vials for complete blood count and analysed through Auto Haematology Analyser .Highly sensitive C-reactive protein estimation Highly sensitive CRP (HS-CRP) was estimated through an auto analyser using the latex turbid metric method, with normal values up to 5 mg/L. Total of 33 women developed PE and out of the remaining 764 were nomotensives during pregnancy.

Inclusion Criteria: 11–14 weeks GA, willing to participate in the study.

Exclusion Criteria: Pregnant women with pre-existing medical disorders such as diabetes before pregnancy, chronic hypertension, cardiovascular diseases, chronic renal diseases, gastroenterology diseases, thyroid diseases and other obstetrical disorders. The data was spread on excel sheet and SPSS18 version was used to analyze.

Results:

A total of 797 antenatal women consented to take part in the study. Of which 33 females developed PE by 28-32 weeks of GA.

A statistically significant mean difference was observed between cases and controls in platelet count, platelet distribution width .The levels of HS-CRP also had a significant difference in the patients who developed pre-eclampsia when compared to normotensives.PCT did not show any significant association with the development of PE.(Table1)

Table 1: Unpaired t test for Pre eclamptic and normotensive pregnant females

Parameters	Category of subjects	N	Mean	Std.deviation	t -value	p - value
Platelet count	Preeclamptic Pregnant females	33	2.31	0.51	2.090	0.03
	Normotesnsives Pregnant females	764	2.54	0.63		
PDW	Preeclamptic Pregnant females	33	15.41	2.05	8.09	0.001
	Normotesnsives Pregnant females	764	13.31	1.42		
PCT	Preeclamptic Pregnant females	33	0.20	0.07	2.56	0.79
	Normotesnsives Pregnant females	764	0.21	0.58		
CRP	Preeclamptic Pregnant females	33	17.36	9.34	26.21	0.001
	Normotesnsives Pregnant females	764	4.40	2.09		

p- Value <0.05 is significant

Discussion

The poorly understood mechanism of pre-eclampsia, the compromised utero-placental outflow causes oxidative damage, initiates local endothelial dysfunction, systemic inflammation and increased vascular permeability.[2]

The platelets are activated by dysfunction at endothelium, thus are lysed at a faster rate, which in turn causes increased turnover of platelets in PE. Platelets adhere to the injured blood vessel to prevent blood loss through a discrete series of steps involving platelet adhesion to the wounded area and platelet activation, i.e., generation of intracellular chemical signals that are initiated by platelet adhesion.

These signals cause rapid morphological changes such as extension of pseudopodia, platelet–platelet aggregation, and granule secretion.[3] This renders platelet indices, such as MPV and PDW, as valuable prognostic markers for thrombo-embolic diseases and platelet activation.[4,5]PE were significantly increased with the increase of PC, PCT, PDW and MPV both at 13–28 GW and 29–32 GW, which indicated that increased values of PC, PCT, PDW and MPV at 13-32 GW were associated with greater subsequent risk of preeclampsia. Increased PC, PCT, PDW and MPV

may have potential to predict preeclampsia before the disease onset [6].Study by Wang ZM etal had similar findings where increased PCT was significantly associated with PE[7] Analysis of platelet volume indices (PVI) indicated mean platelet volume (MPV), platelet distribution width (PDW), and platelet-large cell ratio (P-LCR) as significant risk factors for developing hypertensive crisis. This was in concordance with the elevated blood pressures[8] Blood cell counts in different trimesters and their ratios with MPV can be used as prognostic tool in PE patients[9]A study by Karateke A and his associates showed significant change associated with PDW and MPV levels in severely pre-eclamptic patients when compared to mildly pre-eclamptic patients[10]. Our findings are in similarity with few other studies which opine less PC and an elevated platelet size are common features of PE[11-16].PDW was significantly higher in PE resembling our finding.[17].the PC, PDW, MPV, and PC to MPV ratio on comparison with mild and severe PE did not have any correlation.[18]

Some studies also used PC/MPV ratio to determine the associated changes for PE.[19] The decreased platelet count was also decreased in a study done by Sultana etal.[20]. Estimation of soluble P-selectin (sP-sel) and beta-TG in PE patients was suggested in few studies.[21]Higher levels of HS-CRP in early gestation have been significantly associated with development of PE.[22-23]Such findings are in consistence with our findings.

Limitations

However, the predictive performances like cut-off value, sensitivity, and specificity of these parameters have to be explored for the early diagnosis of PE. Other parameters for platelet morphology and activation like p selectin; PAC 1 and CD62p were not studied due to cost constraints, which could have added relevance to the study.

Conclusion

PC, PDW, CRP among pregnant women can be used as a screening tool for early detection of development of PE. Further supporting markers like p selectin, TNF-alpha, VEGEF gene can be provided to the ante-natal women if they were willing to bear the cost against the complications of PE.

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