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Original Article

Use of platelet count as the first line screening test to detect coagulation disorder in pre-eclamptic and eclamptic patients

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ABSTRACT

Background: *Preeclampsia and eclampsia are appropriate diseases to screen, as it is common, important, and assossiated with increase maternal and perinatal mortality.* ***Objective:*** *To determine the relationship between platelet count and adverse maternal outcomes and to determine the accuracy of platelet count to predict coagulation disorders in patients of pre-eclampsia and eclampsia.* ***Methods and Materials*** *:This was a cross sectional observational study and conducted from 1st march 2013 to 30th august 2013 in the Institute of Child and Mother Health, Matuail, Dhaka, Bangladesh. Total 128 samples were taken from indoor of Institute of Child and Mother Health, Matuail, Dhaka. Purposive sampling technique was followed in this study.* ***Result:*** *Among 128 patients of eclampsia and pre-eclampsia, average mean maternal age for the eclampsia group was 23.12±4.20 years and mean maternal age for the pre-eclampsia group was 28.24±5.86 years. Platelet count > 200,000 / cu mm was present in 6 (4.68 %) eclampsia and PET cases , out of which no patient developed any abnormal coagulation or any complications. Platelet count between 150,000 – 200,000 / cu mm was present in 25 (19.53 %) eclampsia and PET cases , out of which no patient shows any abnormal coagulation but 6 (4.69 %) cases shows adverse maternal outcome like PPH , pulmonary edema, acute renal failure, HELLP syndrome and 3 (2.34 %) patients need blood transfusion . Platelet count between 100,000 -150,000 / cu mm was present in 96 (75%) eclampsia and PET cases , out of which 4 (3.12 %) developed abnormal coagulation and 23 (17. 96 %) cases shows adverse maternal outcome (discussed above) and 16 (12.5 %) cases needs blood transfusion .* ***Conclusion:*** *It is recommended that platelet count can be used as a screening test for early detection of generalized coagulopathy in women with pre-eclampsia and eclampsia. A platelet count < 100 × 109/L should alert caregivers to the real possibility of generalized coagulopathy.*

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INTRODUCTION

Hypertension is a common medical complication of pregnancy, affecting about 6–8% of all pregnancies [1]. . Preeclampsia and eclampsia are part of a spectrum of hypertensive disorders that complicate pregnancy . This complicates about 5 to 10 percent of hypertensive pregnancies and remains a major cause of maternal and neonatal morbidity and mortality [2].

Pregnancy induced hypertension includes Preeclampsia and Eclampsia, according to the Classification proposed by the American College of Obstetrics and Gynecology [3] . Preeclampsia is a pregnancy specific syndrome, actually a multisystemic disorder, diagnosed when the patient is presenting HBP (> 140/90 mmHg) appearing for the first time after week 20 of gestation and can present as late as 4-6 weeks postpartum and proteinuria over 300mg proteins/24h or over 30mg proteins/ dl (1+) persistent; edema – although not a diagnostic criteria – is frequently present [3,4] . Eclampsia is defined when seizures appear in a woman that meets the criteria for preeclampsia [4] ; the seizures are not due to any concomitant neurological disorder. HELLP syndrome is a particular complication of pre eclampsia, defined by hemolysis, elevated liver enzymes, low platelet count. It is interesting to notice that preeclampsia, eclampsia and HELLP syndrome may also develop for the first time their characteristic features after delivery, in post-partum period [5].

The global incidence of preeclampsia has been estimated at 5-14% of all pregnancies and among all cases of the preeclampsia, 10% occur in pregnancies of less than 34 weeks' gestation [6] .The incidence of preeclampsia in the United States is estimated to range from 2% to 6% in healthy, nulliparous women [7] . In developing nations, the incidence of the disease is reported to be 4-18% [8] .With hypertensive disorders being the second most common obstetric cause of stillbirths and early neonatal deaths in these countries [9] . Preeclampsia is mild in 75% of cases and severe in 25% of them [10] .

The pathophysiology of preeclampsia is still discussed and there are several theories attempting to explain it. The most plausible refers to altered placentation – the second step of placentation is incomplete, the spiral arteries of the myomatrium are not correctly invaded by the trophoblast, the transformation of the vessels does not appear, and they remain small caliber vessel, capable of vasospasm, reactive, even with increased vascular reactivity [11] . The result is placental ischemia, followed by the release of a number of vasoactive factors that alter the endothelial function, the platelet function, all conquering to change the balance between vasoconstriction and vasodilatation · The final consequence is endothelial dysfunction, generalized constriction with consequent hypertension, with signs and symptoms of preeclampsia [5] .

Many hemostatic abnormalities have been reported in relation with hypertensive disorders of pregnancy. Thrombocytopenia is the most common of these, existing in 11% to 29% of patients who have pregnancy induced hypertension [12] . The degree of thrombocytopenia increases with severity of disease and the occurrence of thrombocytopenia depend on the

severity of the disease progression. Lower is the number of platelet; the greater is the maternal and fetal morbidity and mortality [14]. Overt thrombocytopenia defined by platelet count <1 lac/mm3 point toward severity of disease process where in most cases delivery is indicated because platelet number continues to decrease after that [14] . In HELLP syndrome having platelet count <1 lacs/ mm3 demonstrate poor fetal outcome [13] . It takes place in 2–12% women with severe pre-eclampsia or eclampsia. Early estimation of severity of PIH is essential to stop complications like HELLP syndrome and increased maternal and fetal morbidity and mortality. Whatever work has been done so far to study the severity of PIH, like platelet count by automated cell counter, in-direct and direct method, test for prothrombin time, partial thromboplastin time (PTT), decrease in α2 antitrypsin, increase fibronectin level/decrease antithrombin III level, increase in SFlf-1 (soluble Fmslike tyrosine kinase-1) concentration, decrease in circulating free placental growth factor (PGF) and vascular endothelial growth factor (VEGF) are though more receptive but expensive, time consuming and require well equipped hospitals- [15] . On the other hand platelet estimation method is rapid, reliable, easier, and cheaper and does not need any expensive materials; therefore prognosis of diseases could be supervised by simple estimation of platelet count.

Pre eclampsia and eclampsia are associated with several complications such as pre term labour, IUGR, IUD, accidental haemorrhage , pulmonary oedema, cardiac failure HELLP syndrome (3%) , DIC (3%) , renal failure (4%) , adult respiratory syndrome(3%), cerrbral haemorrhage (1.2%) [14] . It remains one of the largest single cause of maternal and fetal mortality and morbidity [17,] . They have been reported to account for 14% of direct maternal deaths and 18% of fetal or infant deaths[11,12].Worldwide, preeclampsia and eclampsia are estimated to be responsible for approximately 14% of maternal deaths per year (50,000-75,000) [15] .

Once the diagnosis of pre-eclampsia or eclampsia is established, timely management is the essence to avoid or minimise mortality and morbidity. Clinical prediction of disease complications using a combination of patients' characteristics, symptoms, physical signs and investigations forms the basis of clinical care in these situations [20] . Therefore, there is a need for guidance regarding the best testing strategies with which one can predict the development of complications in pre-eclampsia,as well as allowing clinicians to avoid unnecessary interventions in low risk groups. This would allow high-risk groups to benefit from monitoring of disease severity, use of antihypertensive therapy, administration of anticonvulsants, and antenatal corticosteroids [21] .

Preeclampsia is an appropriate disease to screen, as it is common, important, and assossiated with increase maternal and perinatal mortality. However, although numerous screening tests for preeclampsia have been proposed over the past few decades, no test has so far been shown to appropriately screen for the disease [23,24]. Measurement of urinary kallikrein was shown to have a high predictive value, but it was not reproducible [22]. The fullPIERS model has been validated and was successful in predicting adverse outcomes in advance; therefore, it is potentially able to influence treatment choices before complications arise [18,20].

This study was done to determine the relationship between total platelet count and the risk of abnormal coagulation and adverse maternal outcomes in women with pre-eclampsia and eclampsia.

OBJECTIVE OF THE STUDY

To determine the relationship between platelet count and adverse maternal outcomes and to determine the accuracy of platelet count to predict coagulation disorders in patients of pre-eclampsia and eclampsia.

METHODS AND MATERIALS

This was a cross sectional observational study and conducted from 1st march 2013 to 30th august 2013 in the Institute of Child and Mother Health, Matuail, Dhaka, Bangladesh. Total 128 samples were taken from indoor of Institute of Child and Mother Health, Matuail, Dhaka. Purposive sampling technique was followed in this study. Patients who clinically present with features of pre-eclampsia and eclampsia without any chemical evidence of haemorrhegic menifestations were included in this study. Any maternal abnormalities in pregnancies (such as multiple pregnancy, pregnancy with heart diseases, GDM etc.) except pre-eclampsia and eclampsia and patients who were suffering from other coagulation disorder before pregnancy were excluded from the study. Data were analyzed by using software SPSS version 22.

RESULT

One hundred and twenty eight patients of eclampsia and pre-eclampsia were studied in , Institute of Child and Mother Health, Matuail, Dhaka, from 1st march 2013 to 30th august 2013. Data are expressed in frequency and percentage. Collected data are tabulated in numerical tables. Some are expressed in graphs. Figure 1 shows that most of the eclampsia and pre-eclampsia patients had their educational qualification within primary level.

Table-2.7: Maternal outcome (n=128)

Complications	No	Percentage (%)
Acute renal failure	2	1.56
Pulmonary edema	08	6.25
Postpartum hemorrhage	19	14.84
Maternal death (HELLP Syndrome)	01	0.81
No complication	98	76.56
Total	128	100.0

Table 2.7 shows, in 128 patients 30 patients developed complication and 98 patients had no complication. Maternal mortality rate was 0.81% .

Figure 4 : Platelet count in PPH cases (n=19)

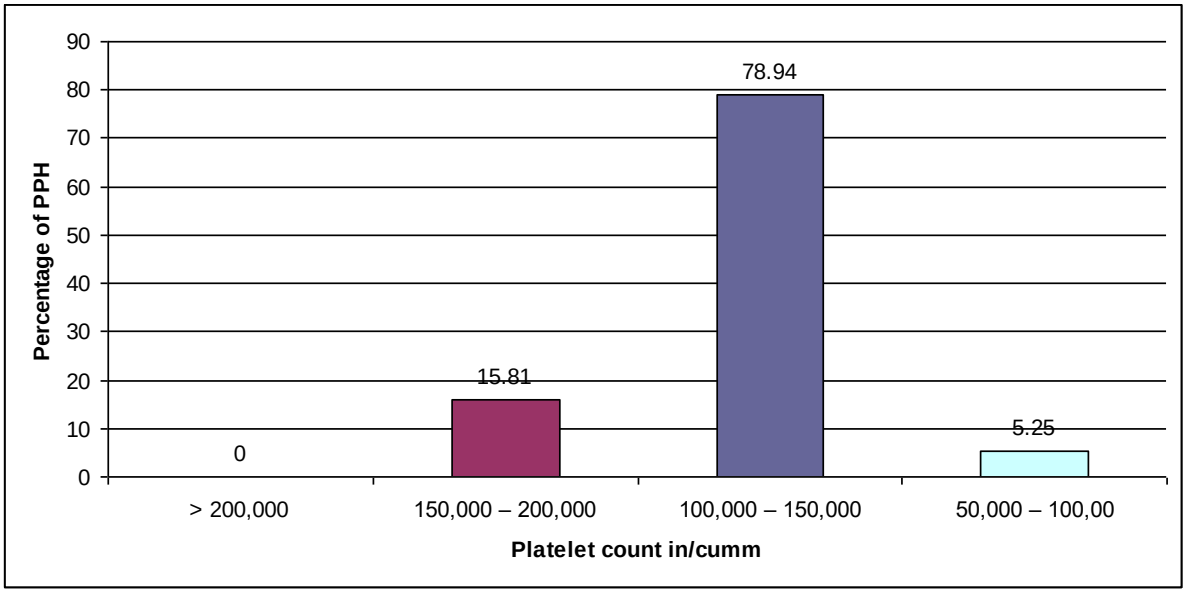

Figure 4 shows , among the 19 PPH patients, maximum that is 15 (78.94%) patients had platelet count between 100,000 – 150,000 / cu mm.

Table-2.8: Fetal outcome (n=128)

Outcome	No	Percentage (%)
Preterm /LBW	63	49.21
Term / Healthy baby	44	34.38
Still birth	11	8.63
Perinatal death	10	7.81
Total	128	100.0

Table 2.8 shows , among the 107 alive baby , 63 (49.21%) were Preterm /LBW baby and 44 (34.38%) were term / healthy baby . Among 21 fetal death , 11 (8.63 %) were still birth and 10 (7.81 %) were Perinatal death

Figure- 5 : Percent distribution of platelet count in pre-eclampsia and eclampsia (n=128).

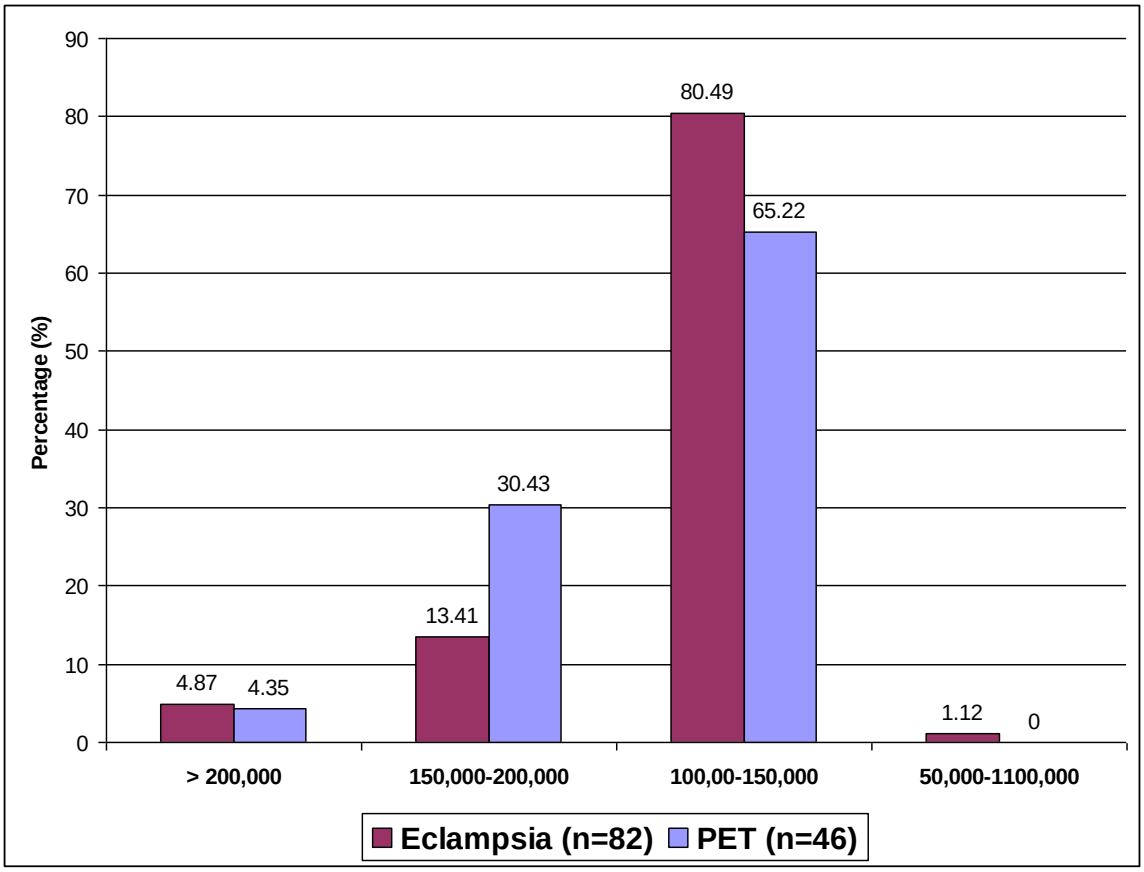

Figure-5 shows that , among 128 patients 97 patients had platelet count < 150X10^9 /L.

able 3: Relation of platelet count among women with preeclampsia and eclampsia and abnormal coagulation or adverse maternal outcome (n = 128).

	Platelet count (×109/L)			
	50-100	100-150	150-200	> 200
Outcome	n = 1	n = 96	n = 25	n = 6
Abnormal coagulation*	1	4	0	0
N (%)	(0.78%)	(3.12%)	(0%)	(0%)
Adverse maternal outcome	1	23	6	0
N (%)	(0.78%)	(17.96%)	(4.69%)	(0%)
Blood transfusion	1	16	3	0
N (%)	(0.78%)	(12.5 %)	(2.34%)	(0%)

DISCUSSION

A cross sectional observational study was done among 128 patients of eclampsia and pre-eclampsia, who were selected from indoor department of Institute of Child and Mother Health, Matuail, Dhaka, of which 82 were eclamptic patients and 46 were pre-eclamptic patients.

In current study, average mean maternal age for the eclampsia group was 23.12±4.20 years and mean maternal age for the pre-eclampsia group was 28.24±5.86 years. Average mean gestational age for the eclampsia group was 33.50±2.58 weeks and average mean gestational age for the pre-eclampsia group was 37.50±3.89 weeks. 58 (70.73%) eclamptic patients and 18 (39.13%) pre-eclamptic patients were primigravida. 24 (29.27%) eclamptic patients and 28 (60.89%) pre-eclamptic patients were multigravida. p value of Mean maternal age, gestational age and gravida is < 0.001, which is significant. Vitthal G Kuchake et al. (2010) conducted a prospective observational study on a total of 971 pregnant women between 24 weeks to 40 weeks gestation, they reported that a total of 73 preeclamptic (7.5%) were observed in between 18-22(61.64%) years of age and in primigravida (n-43) and most of them belong to middle class [14].

In current study, about 66 (51.56 %) babies had born with birth weight < 2500 gm, out of which 38 (57.58%) babies belongs to patients having platelet count 100,00-150,000 / cu mm. About 62 (48.44%) babies had born with birth weight 2500 gm and above, out of which 44 (70.91%) babies belongs to patients having platelet count 100,00-150,000 / cu mm. p value of birth weight in gm in relation to platelet count is p = 0.09, which is not significant. Romero R et al. (1989), reported that, thrombocytopenia was linked with a higher occurrence of intrauterine growth retardation and preterm delivery [15].

Currrent study shows, platelet count in > 200,000 / cu mm in eclampsia is 4 (4.87%) and PET is 02 (4.35%). , platelet count between 150,000 – 200,000 / cu mm in eclampsia is 11 (13.41%) and PET is 14 (30.43%). platelet count between 100,000 - 150,000 / cu mm in eclampsia is 66 (80.49%) and PET is 30 (65.22%). Platelet count between 50,000 - 100,000 / cu mm in eclampsia is 01 (1.21%) and PET is 0 (0%). p value of platelet count (n=128) in pre-eclampsia and eclampsia is p = 0.21 which is not significant . Burrows et al. (1987) reported incidence of thrombocytopenia to be about 17%, Ketlon et al. (1987) reported that 20% of patients with PET developes consumptive thrombocytopenia and Gibson et al. (1982) showed that thrombocytopenia is such a common finding in eclampsia and PET , occurring in about 15 % 0f the patients [16].

Current study shows, platelet count among women with preeclampsia and eclampsia and Relation of platelet count with abnormal coagulation and adverse maternal outcome. Platelet count > 200,000 / cu mm present in 4 eclampsia is and 2 PET patients, out of which no patient developed any abnormal coagulation or any complications. Platelet count between 150,000 - 200,000 / cu mm present in 11 eclampsia and 14 PET patients, out of which no patient shows any abnormal coagulation but 6 (4.69 %) cases show adverse maternal outcome and 3 (2.34 %) patients need blood transfusion. Platelet count between 100,000 - 150,000 / cu mm present in 66

eclampsia and 30 PET cases, out of which 4 (3.12 %) developed abnormal coagulation and 23 (17.96 %) cases shows adverse maternal outcome and 16 (12.5 %) cases needs blood transfusion platelet count between 50,000 - 100,000 / cu mm present in 1 eclampsia and 0 PET patient, out of which 1 (0.78 %) patient shows abnormal coagulation, and also the same patient developed adverse maternal outcome and needs blood transfusion and the same patient dies due to HELLP Syndrome.

A cohort study by PIERS in September 2011 shows that, out of 1405 pre-eclamptic and eclamptic patients, platelet count < 150 × 109/L occurred in 395 women (28.1%) and a total of 122 (8.7%) women had a platelet count < 100 × 109/L and 105 women (7.5%) had abnormal coagulation as defined by an abnormal INR, serum fibrinogen, or both, on the same blood sample as the worst platelet count 84. In total, 152 (10.8%) women had one or more adverse maternal outcomes during their hospital stay. The most common adverse outcomes were a need for blood transfusion, which occurred in 60 women (4.3%) and pulmonary edema, which occurred in 35 women (2.5%). Abnormal coagulation occurred in 105 of 1405 eligible women (7.5Romero R et al. (1989) in their study shows that 11.6% patients with pregnancy induced hypertension were suffered from thrombocytopenia. They reported that thrombocytopenia was more strongly associated with maternal complications and poor neonatal outcome (such as IUGR and preterm delivery) then with hypertension and proteinuria alone [15].

Kelton J et al. (February 2010) reported in their study that thrombocytopenia is the most common hematological abnormality found in eclampsia and pre-eclampsia. They reported that the number of women with very low count is more in women with eclampsia (13.1%) versus 1.1% in the 173 control women. They also observed that severity of PIH and thrombocytopenia are closely associated, which indicates that thrombocytopenia is directly proportional to the severity of pregnancy induced hypertension. A similar study from India reported that that platelet count was significantly low in severe PE group. This result proposes a possible relationship between the platelet count and severity of PE [16].

In a cross-sectional study on 100 patients of PIH recruited from antenatal and eclampsia word of MMCH in 2006 shows that platelet count < 150,000 / cu mm found in 36 (60.00%) eclampsia cases, 10 (29.42%) PET and 01 (16.67%) gestational hypertensive patients. Platelet count found 150,000 – 200,000 / cu mm in 22 (36.67%) eclampsia, 23 (67.65%) PET, 03 (50.00%) gestational hypertensive patients. Platelet count found > 200,000 / cu mm among 02 (3.33%) eclampsia, 01 (2.94%) PET, AND 02 (33.33%) gestational hypertensive patients 90.
This study also shows that in 100 cases 31 patients had complications and 69 patients had no complications. Among the patients who develops complications 12 (12%) had PPH, 3 patients died and the cause of death was acute renal failure in 1 cases and pulmonary edema in 2 cases. And maternal mortality was 3%. Among PPH patients 66.67 % had low platelet count (< 150,000 / cu mm). This study also shows that the birth weight in relation to platelet count. Patients having platelet count < 150,000 / cu mm – 74.28 % babies had born with birth weight < 2500 gms . In patients having normal platelet count (150,000 –

200,000 / cu mm) – 71.80% babies had born with birth weight > 2500 gms [19].

CONCLUSION

This study shows that, thrombocytopenia occurs commonly among women admitted to hospital with pre-eclampsia and eclampsia, and there was a significant association between both a platelet count between 100 - 150 × 109/L and abnormal coagulation test results and an increased risk of adverse maternal outcome, or blood transfusion specifically. A platelet count < 100 × 109/L should alert caregivers to the real possibility of generalized coagulopathy. It is thought that thrombocytopenia is the early manifestation of generalized coagulopathy in pre-eclampsia and eclampsia and the main risk of thrombocytopenia is excessive blood loss during and after delivery. Severity of PET and eclampsia and thrombocytopenia also observed are closely associated which indicates that thrombocytopenia is directly proportional to the severity of PET and eclampsia. Thrombocytopenia was found to be an independent and significant risk factor for the incidence of maternal and perinatal complications in preeclampsia and eclampsia.

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