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Accuracy of Platelet Count in Assessing Severity of Preeclampsia

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ABSTRACT

Background and Objectives: The present cross-sectional study was conducted to determine whether platelet count can predict the severity of preeclampsia (PE) with fair degree of accuracy.

Methodology: The study was carried out at Department of Obstetrics & Gynaecology, Dhaka Medical College Hospital, Dhaka between January 2013 to December 2013 on admitted preeclamtic women. Preeclamptic women ranging between 20-35 years, gestational age between 28-40 weeks and systolic pressure ≥ 140 mmHg and/or diastolic pressure ≥ 90 mmHg with proteinuria were the study population. A total of 96 preeclamptic women meeting the enrollment criteria were included in the study. Of them 76 had severe preeclampsia and 22 had mild preeclampsia. Platelet count below 1,50000/mm^3 of blood was considered low in this study.

Result: Over one-quarter (27.1%) of the patients were < 20 years, 43.8% (20 - 30) years and 29.2% ≥ 30 years old with mean age of the patients being 24.9 years. Over three-quarters (77.1%) of the patients belonged to middle class and 22.9% to lower class. Majority (79.2%) of the women was at term pregnancy with ratio of primigravida and multigravida being roughly 2:3. Eight (8.3%) patients had past history of PET. Over one-third (37.5%) of the patients had systolic blood pressure ≥ 160 mmHg and 27.1% had diastolic blood pressure ≥ 110 mmHg. About 64% of the patients had anemia and 73% had severe proteinuria (albumin 3+). More than 20% of the severe preeclamptics had low (< 1,50,000 per cu-mm of blood) platelet count as opposed to 9.1% of the mild preeclamptic group. The risk of having low platelet count among severe preeclamptics was found to be more than 2-fold (95% CI = 0.5 - 12.1) than their mild preeclamptic counterparts (p = 0.037).

Conclusion: The study concluded that, platelet count tends to fall as severity of preeclampsia increases. However, platelet count alone cannot predict the severity of preeclampsia as majority of the severe preeclampsia bears platelet within normal range.

Key words: Accuracy, Severity, Preeclampsia, Platelet count.

ORIGINAL ARTICLE

INTRODUCTION

Preeclampsia (PE), also known as toxemia of pregnancy, is a serious complication of pregnancy, characterized by high blood pressure, protein in the urine, and retention of fluid. But the condition is also associated with abnormalities of the coagulation system, disturbed liver function, renal failure and cerebral ischaemia.[1] The condition usually resolves soon after delivery, but early delivery increases the risk of complications to the baby. This has to be balanced against delay, which increases the risk that eclampsia will develop, with seizures and organ damage threatening the lives of both mother and baby.[2] About 3-5% of the pregnancies in general are complicated by preeclampsia[3]

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leading to increased maternal and foetal morbidity and mortality. About 10% of women with preeclampsia/eclampsia develops HELLP Syndrome.[4] Other major complications are premature delivery and need for NICU utilization with its inherent problems. About 18% of pregnant women die because of this problem.[5]

Despite many active researches for years, the exact aetiology of this potentially fatal disorder still remains unknown. A number of theories have been put forward where different biochemical markers have been implicated in the causal association of preeclampsia. One such marker is platelet count, the low count of which in the second trimester of pregnancy is considered to be associated with the development of preeclampsia - and the lower the platelet count the greater is its severity. Giles & Inglis[6] demonstrated that both the platelet count and volume became increasingly abnormal when hypertension was accompanied by oedema, proteinuria or both, and women with severe pre-eclampsia or eclampsia had the lowest platelet counts and the highest mean platelet volume. The proportion of patients with thrombocytopenia and/or macrothrombocytosis also varied with the severity of the clinical presentation. Rahim and associates[7] reported that 60% of the eclamptic women exhibit low platelet count (<1,50,000/cmm) and a substantial proportion of them (66.7%) develop postpartum haemorrhage (PPH). However, a prospective study failed to find any association between platelet (PLT) count in the first trimester of pregnancy and the risk for hypertensive disorders later in pregnancy.

Platelet count emerges as a good indicator for assessing severity of preeclampsia, as it is a simple and routinely done method, with lower cost and greater accessibility in the clinical laboratories. But recently question has been raised regarding its accuracy in predicting severity of preeclampsia, for minor abnormalities of PT, PTT, and fibrinogen level were frequent, even in the presence of a normal platelet count.[8] Therefore, further studies are necessary to clarify the role of platelet parameters in the development of PE and its severity. The present study was, therefore, contemplated to see whether platelet count can predict the severity of preeclampsia with fair degree of accuracy.

METHODS AND MATERIALS

This cross-sectional study was conducted over a period of 1 year from January 2013 to December 2013 in the Department of Obstetrics & Gynaecology, Dhaka Medical College, Dhaka. Preeclamtic women attending at the above-mentioned places were the study population. The study included a total 96 preeclamptic women. Of them 76 had severe preeclampsia and 22 had mild preeclampsia. The enrollment criteria employed included subjects were 1) age ranging between 20-35 years, 2) gestational age between 28-40 weeks, systolic pressure ≥ 140 mmHg and/or diastolic pressure ≥ 90 mmHg with proteinuria (defined as > 300 mg/24 hours collected urine or as ≥ 30 mg/ml in a single specimen or proteinuria ≥ 1+ by dipstick) were excluded from the study. A pregnant woman was considered preeclamptic if her blood pressure was ≥ 140/90 mmHg (on two occasions at least 6 hours apart) accompanied by proteinuria. Data were processed and analysed using software SPSS (Statistical Package for Social Sciences) version 16.0. The statistics used to analyses the data were Chi-square (χ^2), Odds ratio and accuracy test.

RESULTS

Over one-quarter (27.1%) of the patients were < 20 years old, 43.8% (20 - 30) years and 29.2% ≥ 30 years old. The mean age of the patients was 24.9 (range: 18-35) years old respectively. More than three-quarters (77.1%) of the patients belonged to middle class and 22.9% to lower class. According to gestational

age, majority (79.2%) was at term pregnancy and the rest 28.8% were preterm. Primigravida were 41.7% and multigravida 58.3%. Eight (8.3%) patients had past history of PET (Table I). About 64% of the patients had anemia and 73% had severe proteinuria (albumin 3+) (Table II). The clinical characteristics demonstrates that more than one-third (37.5%) of the patients had systolic blood pressure ≥ 160 mmHg and 27.1% had diastolic blood pressure ≥ 110 mmHg (Table II).

TABLE I. Distribution of patients by their age (n = 96)

Demographic & obstetric characteristics	Frequency	Percentage
Age (years)		
< 20	26	27.1
20 - 30	42	43.8
≥ 30	28	29.2
Socioeconomic status		
Lower class	22	22.9
Middle class	74	77.1
Gestational age (weeks)		
< 37 (Preterm)	20	28.8
≥ 37 (Term)	76	79.2
Gravida		
Primigravida	40	41.7
Multigravida	56	58.3
History of past PET	8	8.3

Mean age = (24.9 ± 05.0) years; range = (18 - 35) years

TABLE II. Distribution of patients b their clinical characteristics (n = 96)

Clinical variables	Frequency	Percentage
Systolic BP (≥ 160 mmHg)	36	37.5
Diastolic BP (≥ 110 mmHg)	26	27.1
Anemia (Hb < 11 mg/dl)	61	63.5
Severe proteinuria (albumin 3+)	70	72.9

Total will not correspond to 100 % for multiple responses

More than 20% of the severe preeclamptics had low platelet count (< 150000 per cu-mm of blood) as opposed to 9.1% of the mild preeclamptic group. The risk of having low platelet count among severe preeclamptics was observed to be > 2-fold (95% CI = 0.5 - 12.1) than that among mild preeclamptics (p = 0.037) (Table III). Systolic blood pressure ≥ 160 mmHg was significantly common in patients with low platelet count (58.8%) than those with normal platelet count (32.9%) (p = 0.045), although diastolic blood pressure was not significantly associated with platelet count (p = 0.812). Severe proteinuria was also more often found in the former group (88.2%) than that in the latter group (58.2%) (p = 0.020) (Table IV).

TABLE III. Association between severity of preeclampsia and platelet count

Platelet count (per cu-mm of blood)*	Preeclampsia Severe (n=74)	Mild (n=22)	Odds ratio (95% CI of OR)	p-value
Low (<150000)	15(20.3)	2(9.1)	2.5(0.5-12.1)	0.037
Normal (≥150000)	59(79.7)	20(90.9)		

Figures in the parentheses indicate corresponding %;
**Chi-squared Test (χ^2) was done to analyze the data.*

TABLE IV. Association of platelet count with blood pressure and proteinuria

Variables*	Platelet count (per cu-mm of blood) Low (<150000) (n = 17)	Normal (≥ 150000) (n = 79)	p-value
Systolic BP (mmHg)			
<160	7(41.2)	53(67.1)	
≥ 160	10(58.8)	26(32.9)	0.045
Diastolic BP (mmHg)			
< 110	12(70.6)	58(73.4)	
≥ 110	5(29.4)	21(26.6)	0.812
Proteinuria			
1-2+	2(11.8)	33(41.8)	
3+	15(88.2)	46(58.2)	0.020

Figures in the parentheses indicate corresponding %;
**Chi-squared Test (χ^2) was done to analyze the data.*

DISCUSSION

Although it is generally accepted that the hemoglobin concentration decreases and white cell count increases during normal pregnancy, there is less accord regarding changes in platelet indices. The estimation of platelet indices is a reliable method of assessing the severity of pregnancy induced hypertension.[9]

In the present study, an attempt has been made to assess the role of platelet count in assessing severity of pre-eclampsia. The study demonstrated that over 20% of the pregnant women with severe preeclampsia had low (<150000 per cu-mm of blood) platelet count as compared to only 9% of those women with mild preeclampsia. The risk of having developing thrombocytopenia among severe preeclamptics was found to be more than 2-fold (95% CI = 0.5 - 12.1) than their mild preeclamptic counterparts (p = 0.037). The findings suggest that severity of preeclampsia and thrombocytopenia are closely correlated which indicates that lowering of platelet count may be a warning sign of impending preeclampsia and the count tends to fall with the increase of its severity.

Annam and associates[10] in their series demonstrated that normotensive pregnant women had 2,18,440 lac/mm^3, preeclamptic women 1,55,500 lac /mm^3 and eclamptic women 131000 lac/mm^3 which well correlates with findings of the present study. Several studies have reported similar findings as shown in the following table:

Group of pregnant women	Platelet count in different studies (lac/mm^3)		
	Vrunda et al[11]	Dube et al[12]	Mohapatra et al[9]
Normotensive	2,20,000	2,30,000	2,30,000
Preeclampsia	1,40,000	1,90,000	1,80,000
Eclampsia	1,30,000	1,80,000	1,20,000

From the above studies it is evident that compared to normotensive pregnant women, platelet count decreases in preeclampsia and it is even decreased in eclampsia. Thus, platelet count may act as a good marker for assessing the status of pregnancy and severity of preeclampsia. However, it should be borne in mind that normal platelet count does not necessarily rule out that preeclampsia is not of severe category, because majority (80%) of the severe preeclamptic women in the present study had normal platelet count.

Annam et al[10] also showed that there is a gradual increase in mean platelet volume (MPV) from normotensive pregnant women to pre-eclampsia and eclampsia. This increase in MPV in pre-eclampsia and eclampsia probably indicate hyperdestruction of platelets due to shorter platelet half-life.

An increased in platelet distribution width (PDW) is also observed from normotensive pregnant women to pre-eclampsia and eclampsia which correlated with the studies.[10,13] This probably reflects increased platelet turnover which would support the idea that platelet survival time is decreased resulting in increased destruction of platelets.

Many theories are proposed for the pathophysiology of preeclampsia. The formation of a uteroplacental vasculature insufficient to supply adequate blood to the developing fetus results in fetoplacental hypoxia, leading to imbalances in the release and metabolism of prostaglandins, endothelin, and nitric oxide by placental and extraplacental tissues. These as well as enhanced lipid peroxidation and other undefined factors contribute to the hypertension, platelet activation and systemic endothelial dysfunction characteristics of preeclampsia.[14] Activation of coagulation system in small vessels and increased platelet aggregation is present in preeclampsia. It is clear that preeclampsia is one of the causes of maternal thrombocytopenia which improves rapidly after the delivery. There are studies suggesting the storage of platelet in the areas with endothelial damage, as the cause of thrombocytopenia.[7]

Although we did not undertake the study of other platelet indices, the decrease in platelet count with severity of preeclampsia and an increase in MPV, PDW in other studies may form the basis for prediction of pre-eclampsia and its severity in pregnancy.

However, like any other scientific study, the present study is not without limitations. The following limitations deserve mention.

1. The study did not have any control group, for normal pregnant women did not voluntarily participate in the study.
2. No other platelet indices, except platelet count were included in the study. Had the study included MPV, PDW and platelet-large cell ratio (P-lcr).
3. The present study was a cross-sectional one. A prospective study that will follow a cohort of normal pregnant with their baseline platelet count up to term will give better picture of association between platelet count and preeclampsia.

CONCLUSION

From the findings of the study, it can be concluded that, platelet count tends to fall as severity of preeclampsia increases. The study also concluded that the risk of having severe preeclampsia is two time higher with low platelet count than that of having mild preeclampsia. However, platelet count alone cannot predict the severity of preeclampsia as majority of the severe preeclampsia bear normal count of platelet. To make a valid prediction of severity of preeclampsia other platelet indices should be taken into account. A prospective study that will follow a cohort of normal pregnant with their baseline platelet count up to term is recommended to see how many of them develop preeclampsia and whether the preeclamptic women do show platelet count different from those who do not develop preeclampsia. Other platelet indices like MPV, PDW and platelet-large cell ratio (P-lcr) should also be studied along with platelet count to assess the severity of preeclampsia.

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