Original Article

PLATELET COUNT AND MEAN PLATELET VOLUME IN FEMALES PRESENTING WITH PREECLAMPSIA

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ABSTRACT

Objective: To assess the effect of preeclampsia on platelet count and mean platelet volume (MPV) among pregnant women.

Materials and methods: It was a cross sectional study conducted in the Department of Hematology, Chughtai Lab, Lahore from April 2017 to October 2017. A total of 150 pregnant females with preeclampsia were selected for this study. Blood samples were collected under aseptic measures and mean platelet volume (MPV) and platelet count were measured in Haematology auto analyzer within 2 hours of blood collection. Platelet count was verified by peripheral smear examination. Total platelet count and mean platelet volume (MPV), was measured.

Results: Mean platelet count and MPV of preeclamptic women was 164.62 ± 23.90 and 10.59 ± 1.08 respectively. However, age of women and gestational age had no significant effect on platelet count and MPV.

Conclusions: Women with preeclampsia had platelet count within normal range, however a decreasing trend was seen in platelet count and an increasing trend was seen in MPV

Key Words: Platelet function, Platelet count, Mean platelet volume, Pregnant women, Preeclampsia.

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INTRODUCTION

Preeclampsia is a hypertensive disease of pregnancy complicating 5-8% of all pregnancies. A growing body of evidence demonstrated that inflammation in microvasculature plays a major role in the pathogenesis of preeclampsia [1]. Pronounced hemostatic changes occur during pregnancy and the balance shifts markedly in favor of hypercoagulability. Several studies have confirmed the accentuation of platelet activation in preeclampsia, which remains an important obstetric complication affecting ~2 to 4% of pregnancies [2].

Patients with preeclampsia are more likely to have significant decrease in platelet count, increase in MPV. These changes are directly proportional to progressive rise in hypertension [3]. Thus, estimation of platelet indices can be considered as an early, simple and cost-effective procedure in the assessment of severity of preeclampsia.

Platelets play a major role in the disease process of Gestational Hypertension. Mean platelet volume is one of the markers of platelet activation and can be easily measured routinely as a part of complete blood count. Studies relating mean platelet volume (MPV) and Gestational Hypertension are few and reports are contradictory [4].

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Rationale of this study is to assess the effect of preeclampsia on the platelet count and mean platelet volume. Through literature, it has been noticed that in pregnant females with preeclampsia, platelet functioning could also be disturbed which can lead to adverse pregnancy outcome. But contradiction has also been there in literature. Also, there is no local data available regarding this issue which can help us in implementing the proper screening of females for platelet function in preeclamptic females. Therefore, we want to conduct this study so that early screening with the help of platelet count and MPV can be done and females can be prevented from developing hazardous obstetric outcome.

MATERIAL AND METHODS

It was a cross sectional study conducted in the Department of Hematology, Chughtai Lab, Lahore, from April 2017 to October 2017. Non-probability consecutive sampling was done and a sample size of 150 cases was calculated with 95% confidence level, taking expected mean of MPV i.e. 11.56±0.86 in pregnant women with preeclampsia [5]. Females aged 18-40 years with parity<5 presenting at gestational age>24 weeks (on LMP) diagnosed with preeclampsia were included in this study. Preeclampsia was diagnosed on the basis of BP>140mmHg systolic or >90mmHg diastolic measured on two occasions at least four hours apart and protein (>300mg/dl) in urine. Patients with

multiple pregnancies, having fetus with congenital anomaly (on USG), anemia (Hb<11gm/dl)/ aplastic anemia, autoimmune diseases (on medical record), splenomegaly (on medical record), chronic renal disease (creatinine>1.2mg/dl), chronic liver disease (AST & ALT>40IU), diabetes (BSR>186mg/dl), known bleeding disorder (PT>20sec, aPTT>15sec) and drugs having anti-platelet effects (on medical record) were not included in this study. Informed consent was taken. Demographic data (including name, age, gestational age, and parity) were also recorded. BP and proteinuria level was assessed from antenatal record for diagnosis of preeclampsia. Blood samples were collected under aseptic measures and stored in an ethylenediamine tetra acetate (EDTA) vial and mixed gently to avoid clot formation to get accurate platelet count and MPV. MPV and platelet count was measured by Haematology auto analyzer (SYSMEX-XT 4000i) within 2 hours of blood collection. Platelet count was reassessed by peripheral smear examination. Total platelet count and mean platelet volume (MPV), was measured (platelet count will be measured in terms of x10^9/L; normal range is 150-400x10^9/L, MPV will be measured in terms of fl; normal range is 7-11fl).All the collected data was entered and analyzed through SPSS version 20 using mean and standard deviation. Data was stratified for age and gestational age. Independent sample t-test was applied post-stratification taking p-value ≤ 0.05 as significant.

RESULTS

In our study, mean age of women was 28.44±7.05 years. Minimum and maximum age of women was 18 and 40 years. Mean gestational age of women was 36.50±1.37 weeks. Minimum and maximum gestational age of women was 35 and 39 weeks. Mean platelet count of women was 164.62±23.90. Minimum and maximum platelet count of women was 125 and 194 respectively (Table-1). Mean MPV count of women was 10.59±1.08. Minimum and maximum MPV count was 9 and 12 (Table-2). Mean platelet count and MPV count showed not statistically significant difference in women in the age group 18-30 years and 31-40 years. Platelet count [18-30 years: 164.11±24.18 & 31-40 years: 165.38±23.67, p-value=0.751] & MPV count [18-30 years: 10.47±1.10 & 31-40 years: 10.78±1.04, p-value=0.081] (Table-3) Mean platelet count and MPV count did not show statistically significant difference in women in relation to their gestational age. Platelet count [35-36 weeks: 164.52±24.30 & 37-39 weeks: 164.68±23.78, p-value=0.967] & MPV count [35-36 weeks: 10.60±1.07 & 37-39 weeks: 10.59±1.10, p-value=0.928] is shown in Table-4.

Table-1: Descriptive statistics for platelet count.

Number of cases	150
Mean	164.62
SD	23.90
Minimum	125
Maximum	194

Table-2: Descriptive statistics for MPV count.

Number of cases	150
Mean	10.59
SD	1.08
Minimum	9
Maximum	12

Table-3: Descriptive statistics for Platelet count & MPV count stratified for age of women.

Age	Platelet Count	MPV Count
18-30	164.11±24.18	10.47±1.10
31-40	165.38±23.67	10.78±1.04
t-test	0.318	1.75
p-value	0.751	0.081

Table-4: Descriptive statistics for Platelet count & MPV count stratified for gestational age of women.

Gestational Age	Platelet Count	MPV Count
35-36	164.52±24.30	10.60±1.07
37-39	164.68±23.78	10.59±1.10
t-test	0.042	0.090
p-value	0.967	0.928

DISCUSSION

Preeclampsia is a complication during pregnancy that occurs beyond 20 weeks' gestation and can present as late as 4-6 weeks postpartum. It is characterized by hypertension, proteinuria and may be associated with edema [6]. Preeclampsia and eclampsia remains one of the causes of perinatal mortality and maternal death in developing countries. Several studies suggested that placental change is a critical event responsible for causing preeclampsia [7].

In a study conducted in Dhaka, it was noticed that platelet count was 300.94 ± 69.72x10^9/L, in normal pregnancy (n=32) and 219.69 ± 63.73x10^9/L in patients with preeclampsia (n=32). The difference was significant (P<0.01). MPV was 10.05 ± 0.71 fl, in normal pregnancy (n=32) and 11.55 ± 0.86 fl in patients with preeclampsia (n=32). The difference was significant (P<0.01) [5]. Many studies supported the fact that platelet aggregation occurs in

preeclampsia; whereas few studies depicted no such change in females with preeclampsia [8]. In another study conducted in Turkey, it was noticed that platelet count was 220 ± 79x10^9/L, in normal pregnancy (n=56) and 227 ± 71x10^9/L in patients with preeclampsia (n=43). The difference was insignificant (P>0.05). MPV was 9.45 ± 1.11fl, in normal pregnancy (n=56) and 9.18±.52fl in patients with preeclampsia (n=43). The difference was insignificant (P>0.05) [9].

The underlying mechanism of preeclampsia is still incompletely known, but a majority of researchers are of the view that preeclampsia is stimulated by placental ischemia [10]. However, Wael Ahmed Ezzatkamel Ammar, Letícia Gonçalves Freitas and Razia Sultana in their studies showed that there was a significant difference of platelet count and MPV in normal pregnant and in women with preeclampsia i.e. platelet count was low and MPV was raised in preeclamptic females as compared to normal pregnant females [11-13].

Although in this study mean platelet count was 164.11 which is above the normal limit for platelet count still 35% women platelet count was <150. This finding is consistent with findings reported in above mentioned studies in which it was reported that among women with preeclampsia, platelet count was reduced as compared to women without preeclampsia. The same trend was seen for MPV count. However, 26.66% women's MPV count was 12. However, results of our study are not in accordance to those studies who have reported significant difference for platelet and MPV count among women with and without preeclampsia.

Many retrospective and longitudinal studies have explored the significance of MPV in the early detection of preeclampsia. A longitudinal study suggested that pregnant women in second trimester with raised MPV at any given time are likely to develop preeclampsia [14]. Our results are in agreement with the above stated study that there is a correlation of platelet count and MPV. Although platelet count has been found within normal range, our results demonstrated a decreasing trend in platelet count with raised MPV. It can be expected that undefined events in addition to platelet consumption might explain such finding. In the study conducted by Nitesh Thalor, Kanika Singh, Mukta Pujani, Varsha Chauhan, Charu Agarwal, Rashmi Ahuja, it was highlighted that changes in MPV may be more sensitive than platelet count as an indicator of altered function in pregnant females with normal blood pressure [15]. In another study conducted by Shilpa Gopal Reddy, Chinaiah Subramanyam Babu Rajendra Prasad, it was also reported that MPV correlated more with the severity of preeclampsia than the platelet count [16]. Table-5 shows a comparison of different international studies depicting the significance of platelet count and MPV in females with preeclampsia.

It is noticeable that some researchers failed to confirm platelet count and MPV as early indicators of preeclampsia, but it may be attributed to the methods and/or equipment used to obtain hemogram [17]. Probable pathophysiology of preeclampsia-associated thrombocytopenia could be increased destruction of platelets caused by non-immunological factors [18]. However, several studies reveal that results of in vitro testing show increased tendency of platelet aggregation during preeclampsia [9].

Whenever the endothelium is injured, platelets come in contact with the endothelium and activates coagulation cascade. This results in both platelet consumption and production of platelets from bone marrow. Increased thrombopoiesis produces

Table-5: Comparison of different international studies illustrating the significance of Platelet count and MPV in preeclampsia.

Study	Mean platelet count/median interquartile range in normal pregnant females	Mean platelet count/median interquartile range in preeclamptic females	Mean MPV/median interquartile range in normal pregnant females	Mean MPV/median interquartile range in preeclamptic females	Significant effect of platelet count and MPV in preeclampsia
Mondal BR *et al*	300.94±69.72x10^9/l	219.69±63.3x10^9/l	10.05±0.7fl	11.55±0.86fl	Significant
Ceyhan T *et al*	220±79x10^9/l	227±71x10^9/l	9.45±1.11fl	9.18±0.52fl	Insignificant
Shilpa R, Chinaiah	395.59(79)	181(38.9)	8.07(0.8)	11.67(1.4)	Significant
Nitesh Thalor *et al*	2.14(0.74)	2.17(0.78)	10.5(2.8)	11.8(1.7)	Significant
Muneera A Al Sheeha *et al*	259.0 (215.7-322.7)	236.5 (176.0-278.25)	10.1 (9.4-10.8)	10.0 (9.3-10.8)	Insignificant

immature platelets, which have a larger volume (increased MPV) than the mature platelets [19].

CONCLUSION

Evaluation of platelet count and platelet indices can be considered as a potential early and economical means of assessment of severity of preeclampsia. Also, platelet indices can be helpful in predicting the prognosis of preeclampsia in pregnant women.

AUTHORS CONTRIBUTION

Mavra Fatima: Principal author, paper writing and results compilation.

Usman Javed: Data collection, literature review

Ayisha Imran: Result compilation.

Numaan Aslam Malik: Literature review.

Akhtar Sohail Chughtai: Overall supervision of project.

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