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# Platelet Distribution Width: A Severity Marker Of Pre Eclampsia, Experience At Tertiary Care Hospital

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## Abstract

**Objectives:** To determine mean platelet distribution width in patients with pre-eclampsia.
**Study design:** This is a cross-sectional, descriptive study performed in the Department of Obstetrics and Gynecology, Benazir Bhutto Hospital, Rawalpindi, retrospectively from 01 May 2017 to 01 November 2017 by non-probability consecutive sampling technique.
**Materials & Methods:** A total of 150 pregnant females with mild and severe pre-eclampsia with gestational age > 20 weeks, and an age limit of 18-40 years were included in the study. Patients having deranged coagulation or multiorgan involvement were excluded. Blood and urine samples were collected at the time of presentation. All the blood pressure readings were confirmed by two readings 4-6 hours apart. Mean ± SD was used to express data values. The mean PDW value was calculated for pregnant females with mild and severe preeclampsia.
**Results:** In our study Mean PDW in patients with preeclampsia was 15.86± 0.34. The mean PDW for mild preeclampsia was 15.8± 0.35 and for severe preeclampsia 15.98±0.28..
**Conclusion:** PDW is a useful marker for the prediction of the severity of preeclampsia before the disease progresses to severe preeclampsia and HELLP. Raised values can help the obstetrician to actively manage the patients in time to reduce maternal and fetal mortality.
**Keywords:** pre-eclampsia.

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## 1. Introduction

Pre-eclampsia is a disease of pregnancy characterized by a Blood Pressure of 140/90 mmHg or more on two separate occasions 4-6 hours apart after the 20$^{th}$ week of pregnancy in a previously normotensive woman. This is accompanied by significant proteinuria (>300mg in 24 hours or>1+ on urine dipstick)[2]. Patients were categorized as having mild and severe preeclampsia based on diastolic blood pressure of ≤110 or ≥ 110 mmHg respectively[10]. Patients having headaches, visual disturbances or pain epigastrium were also included in sere preeclampsia group according to ALSO guidelines.

Preeclampsia is a multi-organ disease affecting 3% of pregnancies[3]. It is the leading cause of death of the mother and the baby in developing countries[5]. It has detrimental effects on the mother involving the liver, brain, kidneys, vascular endothelial cell function and coagulation system[1]. Placental abruption, intrauterine growth restriction, oligohydramnios, preterm birth and stillbirth of the fetus are other complications[5]. The exact etiology of pre-eclampsia is not known but it is observed in several studies that uncontrolled platelet activation and aggregation occur even in non-thrombocytopenic pre-eclampsia.[1] In severe pre-eclampsia low-grade, intravascular coagulation takes place which causes consumption of the platelets. As a result, the platelets count falls[6]. Low platelet count indicates the severity of pre-eclampsia as well as the development of HELLP Syndrome. Recent studies show another important observation. There is an increase in platelet size, and they develop pseudopodia increasing platelet distribution width (PDW)[7,8]. Plateletcrit (PCT) and mean platelet volume (MPV) are other platelet indices which can be useful markers for the prediction of preeclampsia, but evidence of their use is lacking.[1]

The severity of pre-eclampsia is directly proportional to maternal and fetal mortality and morbidity. Early detection of pre-eclampsia can help in minimizing the damage to the vital organs of the mother as well as improving the perinatal outcome. Serum uric acid and protein: creatinine ratio are well-established markers for severity of disease but at this stage, the disease has already progressed to severe form and not much can be done at this stage to reduce morbidity. Initially, in pre-eclampsia the coagulation function of the platelets

of the mother is affected, they become larger in size, more active and thrombogenic as compared to smaller ones[1]. The increase in PDW can be used as a tool and early marker to predict the severity of pre-eclampsia. According to the study by Yang SW, Kwon HS, Sohn IS, Hwang H PDW was significantly raised in mild pre-eclampsia (17.6± 2.5) as well as in severe pre-eclampsia (18.7±0.8), whereas PDW in normal pregnant females was 16.3± 2.1 (p-value of < 0.005). According to them, PDW is associated with both the presence and severity of pre-eclampsia. Muneera A Al Sheeha, Rafi S Alaboudi, Mohammad A Alghasham, Javed Iqbal, Ishag Adam[10] found no significant difference in PDW among women with severe preeclampsia, mild preeclampsia, and healthy controls. Given these conflicting results, we conducted the study to prove the relationship of PDW with preeclampsia and its feasibility for use as a severity marker for preeclampsia.

Patients of pre-eclampsia are usually looked for platelet count only. Low platelet count is a late development in the process of pre-eclampsia. Assessment of PDW at an earlier stage will help in early detection of the severity of pre-eclampsia. The rationale of this study was to assess the relationship between the severity of pre-eclampsia with PDW as well as to evaluate the feasibility of using PDW as a severity marker for pre-eclampsia.

## 2. Materials & Methods

This study is descriptive and cross-sectional in nature. The study was conducted in the Department of Obstetrics and Gynaecology, Benazir Bhutto Hospital, Rawalpindi which is a 750 bedded tertiary care hospital with average maternities of 900- 1000 per month with 40-45 patients having preeclampsia every month. The study was conducted in the duration of 01 May 2017 to 01 November 2017 through a non-probability, consecutive sampling technique with the following inclusion and exclusion criteria. Pregnant females with gestational age >20 weeks with an age limit of 18-40 years having mild and severe pre-eclampsia were included in our study. However, patients having HELLP Syndrome, ITP and other platelet function disorders, hemolysis, proteinuric hypertension and patients with impaired liver function were excluded from our study. Informed consent of the patients was taken to include their data in the study. History, physical examination and demographic information of all the patients were recorded.

Blood and urine samples of patients with mild and severe pre-eclampsia were taken at the time of presentation at Benazir Bhutto Hospital. Blood samples were collected in tubes containing EDTA and in tubes without an anticoagulant. The platelet count and platelet indices were calculated by using an automated quantitative haematology analyzer. All the blood pressure readings were confirmed by two readings 4-6 hrs apart. For all the sample data mean PDW value was calculated for both pregnant females with mild and severe pre-eclampsia.

Statistical analysis:

Data was entered and analyzed in SPSS version 16.0. Mean and Standard deviation were calculated for PDW in patients with mild and severe pre-eclampsia.

Effect modifiers like age and gestational age, parity, and severity of pre-eclampsia of the patient were controlled by stratification. Post-stratification independent sample t-test was applied, keeping p-value < 0.05 as significant.

## 3. Results

A total of 150 patients were included in our study. Out of them 123 (82%) had mild pre-eclampsia and 27 patients (18%) had severe pre-eclampsia. The demographic details in terms of age, parity, and BMI between the study groups were comparable. The age range in this study was from 18 to 40 years with a mean age of 28.10 ± 4.8 years. The mean gestational age of patients having pre-eclampsia was 35.8 ± 3.37 whereas the mean parity was 1.4 ± 1.9.

**Table-1** Gratification of the severity of pre-eclampsia in terms of demography

| | **Mean ± SD** | |
|---|---|---|
| | **Mild Preeclampsia** | **Severe Preeclampsia** |
| **Age** | 28.6±4.77 | 25.8±4.2 |
| **Parity** | 1.6±2.0 | 0.59±1.0 |
| **Gestational Age** | 35.8±3.2 | 25.8±4.2 |

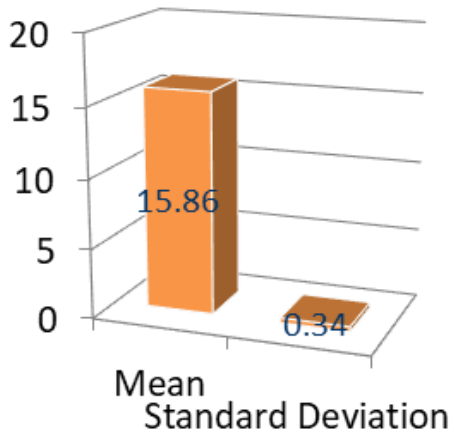


**Figure-1** Mean platelet distribution width in patients with pre-eclampsia.

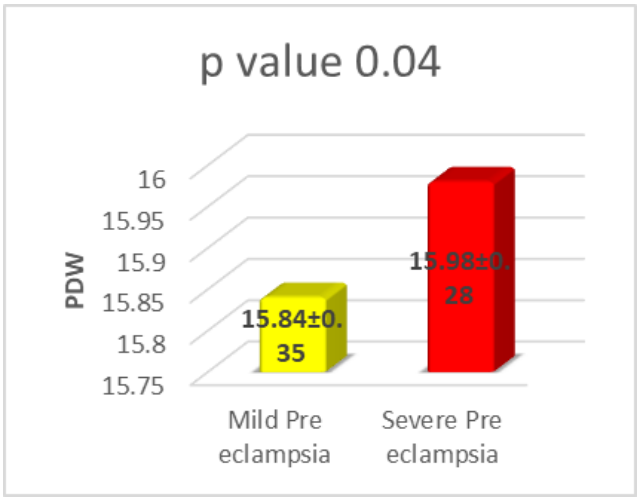


**Figure-2** Stratification of Mean platelet distribution width concerning the severity of preeclampsia.

## 5. Discussion

It is observed in our study that PDW has a close association with the severity of pre-eclampsia. PDW is significantly higher in the severe pre-eclampsia group than in mild pre-eclampsia. These results are from the study conducted by Yang SW, Kwon HS, Sohn IS, Hwang H PDW, however, they compared the values among normal pregnant females and pre-eclamptic patients but we didn't. The mean age of patients included was almost the same in both studies however mean gestational age in our study was 35.8± 3.37 weeks as compared to the 37- 38 ±1 weeks. According to them, PDW is associated with both the presence and severity of pre-eclampsia.

According to a study conducted by Solomon GebreBaworeet al[4] PDW was raised in patients with pre-eclampsia, however, they also included 28 patients with thrombocytopenia in their study but we excluded such patients in our study to prevent any bias in our results. The patients included in their study were matched in age and parity with our patients however the preeclamptic patients included in their study were 60 which is much less than our sample size.

**Table-2** Stratification of Mean platelet distribution width concerning age groups

| Age groups | Platelet distribution width | | P-value |
|---|---|---|---|
| | Mean | SD | |
| **18-30** | 15.90 | 0.32 | **0.0164** |
| **31-40** | 15.71 | 0.39 | |

Muneera A Al Sheeha, Rafi S Alaboudi, Mohammad A Alghasham, JavedIqbal, Ishag Adam[10] found no significant difference in PDW among women with severe preeclampsia, mild preeclampsia, and healthy controls. Nonetheless, a significantly higher level of PDW has recently been observed among women with preeclampsia.[10] They took 60 patients of pre-eclampsia to compare with normal patients which is quite less than our pre eclamptic patients (n=150). The age of patients was almost comparable in both studies but parity in their study was higher than in our patients. The gestational age of their patients was less than our group.

PDW is easy to calculate with no added cost to the patients. By correlating its association with the severity of pre-eclampsia we can get help in counselling and management of pre-eclampsia before the disease progresses to severe form and develop complications.

In our study, we did not include other platelet indices. The values of PDW were noted at the time of presentation and not over the period from the first trimester to the third trimester. This is the limitation of the over study, however, in light of our results, we suggest that more such studies should be conducted to establish the role of PDW in predicting the severity of pre-eclampsia in our country.

## 5. Conclusion

This study concluded that PDW is a useful marker for the prediction of severity of preeclampsia especially in normal platelet count preeclampsia, before the disease progresses to severe preeclampsia and HELLP. Raised values can help the obstetrician to actively manage the patients in time to reduce maternal and fetal mortality. We recommend that platelet distribution width should be used as a severity marker for pre-eclampsia which will further help in managing these patients properly.

**CONFLICTS OF INTEREST-** None

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**Contributions:**
M.Z - Conception of study
M.Z - Experimentation/Study conduction
S.S - Analysis/Interpretation/Discussion
H.N - Manuscript Writing
M.Z - Critical Review
M.Z - Facilitation and Material analysis

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