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Original Research Article

ANALYTICAL ASSESSMENT OF HEMATOLOGICAL PARAMETERS IN PRE-ECLAMPSIA PATIENTS: A HOSPITAL-BASED STUDY

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ABSTRACT

Background: Hypertensive disorders are the major cause of maternal mortality (5-11%). Studies suggested that pre-eclampsia (PE) leads to activation of many immunological factors as increase in neutrophils count, platelet activation. So, many hematological parameters are affected in this process. **Aim:** This study was aimed to assess the role of hematological parameters as a predictor of pre-eclampsia. **Materials and Methods:** This is a comparative cross-sectional study conducted in Department of Pathology. Study duration was one year (from 01/02/21 to 31/01/22). This study includes 150 pregnant women (75 pre-eclampsia cases and 75 normotensive pregnant women). Patients with co-morbidities like hypothyroidism, diabetes mellitus, hypertension, intrauterine death were excluded from study. Blood samples were collected from all the study participants of both the group. These samples were run by automatic analyzer. All the indices including red cell distribution width (RDW), Platelet count, mean platelet volume (MPV), Plateletcrit (PCT), neutrophil-lymphocyte-ratio (NLR), platelet-lymphocyte-ratio (PLR) etc. were analyzed. Then these variables were tested statistically. **Result:** The results of statistical analysis showed that the mean values of RDW, platelet count & neutrophil-to-lymphocyte ratio (p value respectively ≤0.001, 0.018 & 0.007) was found statistically significant between the two study groups. **Conclusion:** Platelet count, RDW & NLR can be used as a simple, cost-effective, quick and reliable predictor in patients of PE.

INTRODUCTION

Hypertensive disorders are the major cause of maternal mortality, these disorders complicate approximately 5-11% of all pregnancies. In these disorders pre-eclampsia (PE) is a leading cause of maternal and fetal morbidity and mortality worldwide. It affects 3-5% of all pregnancies in all gestations.[1] According to the American College of Obstetricians and Gynecologists, PE is a characterized by high blood pressure (≥140 mmHg systolic and ≥90 mmHg diastolic) on two occasions 4 hours after 20 weeks, and proteinuria (Protein/creatinine ≥ 0.3 or dipstick reading of 1+) or in the absence of proteinuria, new onset of hypertension with any of the following:

(i) thrombocytopenia (PC≤100,000/microliter),
(ii) renal insufficiency (serum creatinine ≥1.1mg/dl),
(iii) elevated serum liver transaminases to twice of upper limit of normal concentration),
(iv) pulmonary edema,
(v) cerebral or visual symptoms after 20 weeks of pregnancy.[2]

The exact etiology of pre-eclampsia is unknown, many studies suggested that inappropriate placentation, placental ischemia, abnormal remodeling of spiral arteries, oxidative stress between mother and fetus, angiogenic imbalance in maternal circulation and increase vascular permeability contribute in development of PE.[3] This leads to activation of many immunological factors such as increase in neutrophils count, platelet activation, systemic inflammation and endothelial dysfunction.[4] Activation of inflammatory and immunological response causes marked increase in neutrophils count as well as functional modulation of neutrophils which results in superoxide production and ultimately leads endothelial dysfunction and

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damage.[5,6,7] The generalized endothelial dysfunction causes vasoconstriction and end-organ ischemia which leads clinical presentation of PE and also changes in various hematological parameters.[8,9] In untreated cases of PE, disease can progress to eclampsia, HELLP syndrome, disseminated intravascular coagulopathy (DIC).[10,11]

So early diagnosis plays an essential role in predicting the outcome of pregnancy in both mother and baby. The aim of our study was to assess the role of hematological parameters:

platelet count (PC), mean platelet volume (MPV), plateletcrit (PCT), platelet to lymphocyte ratio (PLR), red cell distribution width (RDW) and neutrophil to lymphocyte ratio (PLR) as a predictor of pre-eclampsia.

MATERIALS AND METHODS

This is a comparative cross-sectional study conducted in Department of Pathology from 01/02/21 to 31/01/22. This study includes 150 pregnant women (75 pre-eclampsia cases and 75 normotensive pregnant women). In both groups we included pregnant women in their reproductive age group with informed consent who presented in second & third trimester. We excluded the pregnant women with all other hypertensive disorder of pregnancy, twin pregnancy, co-morbidities like chronic systemic disease during pregnancy such as diabetes mellitus, renal or hepatic dysfunction, cardiovascular diseases, symptomatic infectious diseases, fetal structural or genetic anomaly, bad obstetric history in past, participants. on any medication such as corticosteroid prior to sample collection. Ethical clearance was obtained from the institutional Ethical Committee.

A detailed clinical history had taken, after obtaining necessary consent clinical examination (Height, weight, pallor, pedal edema, heart rate, blood pressure, dyspnea, obstetric examination as required) was performed, BP was measured, urine albumin was estimated by using dip stick or 24 hours urine protein analysis and routine urine microscopy was performed. Venous blood samples were taken under all aseptic precautions and prior to starting of any medication if pregnant women in the labor. All samples were processed within 2 hours of venipuncture in an automatic blood cell counter Sysmex 5part-XN1000 and complete blood count of the samples was carried out. The hematological parameters including RDW, Platelet count, MPV, Plateletcrit etc. were analyzed. NLR and PLR calculated after obtaining the absolute values. Then these variables were tested statistically.

RESULTS

The data collected were entered in the Microsoft excel spreadsheet and scrutinized for completeness and correctness. The final data was analyzed using appropriate Statistical tools using, IBM statics SPSS software, version 25, Chicago USA. Unpaired student's t-test & Chi-square tests applied for statistical interpretation.

Table 1: Comparison of mean values of various variables between pre-eclampsia and non-preeclampsia study groups

Serial no.	Variable name	Pre-eclampsia group (n=75) Mean ± SD	Non-Pre-eclampsia group (n=75) Mean ± SD	Statistical interpretation (p- value)
1.	Age	25.5±3.7	24.6±3.1	p = 0.112
2.	Gestational age	36.6 ± 1.7	37.1±1.6	p = 0.070
3.	RDW	16.2 ± 2.2	14.7 ± 2.2	p < 0.001
4.	Platelet count	169.0 ± 64.3	193.9 ± 62.9	p = 0.018
5.	MPV	11.0 ± 3.4	10.1 ± 2.3	p = 0.068
6.	Platelecrit	0.18 ± 0.07	0.19 ± 0.05	p = 0.587
7.	PLR	100 ± 60.09	107.8 ± 47.5	p = 0.398
8.	NLR	6.3 ± 4.3	4.7 ± 3.0	p = 0.007

The results of statistical analysis showed that the difference between mean values of RDW, platelet count & neutrophil-to-lymphocyte ratio (p-value respectively <0.001, 0.018 & 0.007) was found statistically significant between the two study groups. The difference between mean values of age, gestational age, platelet count, MPV, plateletcrit & platelet-to-lymphocyte ratio (p- value respectively 0.112, 0.07,0.018, 0.068, 0.587 & 0.398) was found stastically insignificant between the two study groups.

Mean value of RDW was significantly higher in women with PE compared with normotensive pregnant women (16.2±2.2 vs 14.7±2.2, p value < 0.001). Mean platelet count was significantly lower in women with PE compared with normotensive women (169.0 ± 64.3 vs 193.9±62.9, p=0.018). Mean NLR was significantly higher in women with PE compared with normotensive pregnant women (6.3±4.3 vs 4.7±3.0, p = 0.007)

SD & mean values of MPV in cases is comparatively higher as compare to control group. It is higher than the normal range in 54.7% cases while it is higher side of normal range in the control group

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Table 2: Show the age distribution of normotensive women and PE women

Age group (in years)	Pre-eclampsia N (%)	Normotensive women N (%)
15-20	4%	9.3%
21-25	57.3%	57.3
26-30	28%	30.7%
36-40	10.7%	2.7%

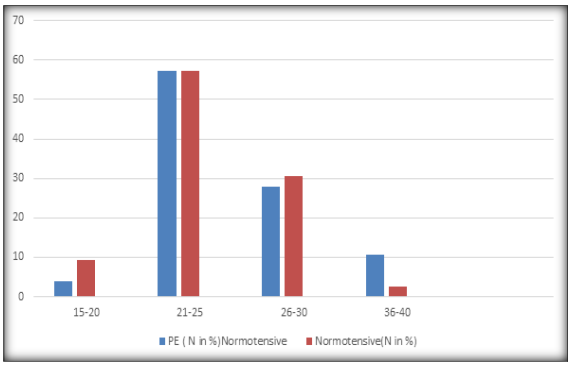

Table 2: Illustrate the age distribution of normotensive women and PE women

Table 2 and figure 1 show the maximum number of normotensive women and PE women present in between the age group of 21-25 years.

DISCUSSION

PE is a multiorgan disease which has exact unknown etiology with studies suggested that inflammation and immunological factors play an important role in pathogenesis.

The association between RDW and PE was studied in many studies. A hypothesis is given in reference to this association; activation of inflammatory process causes an increase in interleukin-6 levels. The interleukin-6 impairs iron metabolism and erythrocyte maturation which ultimately leads to variation in RDW.[12] In our study RDW is significantly higher in PE patients as compared to normotensive pregnant. Similar results were seen in study of Kurt et al. 2015 & Sen-yu et al. 2016 that show RDW levels were higher in PE patients than normotensive pregnant.[12,13] Abdullahi et al. 2014 in their study observed that RDW is not associated with presence or severity of PE.[14]

Coagulation system activation plays an important role in PE pathogenesis and manifests as low platelet count, increase in MPV, & PDW.[15] In our study platelet count was significantly decreased in the PE group (169.0±64.3 × 10^9/L) compared to the normotensive pregnant group (193.9±62.9 × 10^9/L). Similar results were seen in the studies of Tesfay et al. 2019 and Annam et al. 2011,[16,17] However, significant difference was not observed in studies of Abass et al. 2016 and Kurtoglu et al. 2016.[18,19]

This study showed that difference in mean value is insignificant but SD & mean values of MPV in cases is comparatively higher as compare to control group. It is higher than the normal range in 54.7% cases while it is higher side of normal range in the control group. Study of Amita et al. 2015 & Altinbas et al. 2011 also found similar results to this study, there was no significant difference in MPV between cases and controls.[20,21] The result of Vilchez et al. 2017 study and Kashanian et al. 2013 study show MPV is heigher in pre-eclampsia than normotensive pregnant women.[22,23]

In our study difference in mean values of PCT is statistically insignificant between cases and controls. Similar results were seen in studies done by Abass et al. 2016 & Gogoi et al. 2019.[18,24] Karateke et al 2015 study found lower PCT in severe PE women than mild PE and in normotensive pregnant women.[25]

Several studies demonstrated that high NLR & PLR is associated with increased inflammation and studies suggested that high NLR & PLR can be used for prediction of vascular events which are associated with increased inflammation. In our study NLR is significantly higher in PE than normotensice pregnant romen. Studies conducted by Gorgoi et al 2019, Prasmusinto et al 2017 & Kurtoglu et al. 2015 showed NLR is significantly elevated in PE as compared to normotensive pregnant.[24,26,27] Study of Serin et al 2016 also found NLR is significantly increases in PE compare to normotensive pregnant women and tey also found a positive correlation between PE and proteinuria.[28] Yavuzcan et al. 2014 in their study did not find statistically significant higher NLR value in PE cases compared to control group.[29] Meta-analysis study of Zheng et al. 2019 showed that diagnostic accuracy of NLR specificity was less satisfactory but sensitivity is diagnostically useful in PE.[30]

In our study PLR is lower PE women in compare to normotensive women but did not statistically significant. Similar result was seen in study of Kirbas et al. 2015.[31] Yavuzcan et al. 2014 in their study found PLR is significantly lesser in PE as compared to normotensive women.[29]

CONCLUSION

In conclusion of our study found mean difference values of platelet count, RDW & NLR are statistically significant so that platelet count, RDW & NLR can be used as a simple, quick and reliable predictor of PE in pregnant women because these hematological tests are routine and cost-effective.

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