



COMPARISON OF NEUTROPHIL-LYMPHOCYTE RATIO (NLR), PLATELET LYMPHOCYTE RATIO (PLR), AND MEAN PLATELET VOLUME (MPV) IN PREECLAMPSIA AND NORMAL PREGNANCY

M. Iman Syahputra*

Department of Obstetric and Gynecology. Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia *Corresponding Author

Sarma N Lumbanraja

Department of Obstetric and Gynecology. Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia

Deri Edianto

Department of Obstetric and Gynecology. Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia

M Fidel Ganis Siregar

Department of Obstetric and Gynecology. Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia

Melvin N.G. Barus

Department of Obstetric and Gynecology. Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia

Riza Rivany

Department of Obstetric and Gynecology. Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia

ABSTRACT

Aim: To compare the value of NLR, PLR, and MPV in women with preeclampsia and normal pregnancy.

Method: Analytic study with Case Control design, conducted in December 2018 at Adam Malik General Hospital Medan. Data of the patients who fulfilled the inclusion and exclusion criterias were obtained from medical record. Statistical analysis was performed and declared significant at $p < 0,05$. 70 subjects with preeclampsia were obtained, with 70 subjects with normal pregnancy as control.

Result: Median of NLR in normal pregnancy was 2,33 (min-max 0,77-6,64), median NLR in preeclampsia was 4,12 (min-max 1,81-16,50) with $p = 0,001$. Weak positive correlation was found between NLR and Systolic Blood Pressure of preeclampsia group at admission ($p = 0,046$, $r = 0,239$) and at discharge ($p = 0,043$, $r = 0,242$). No significant differences were found in PLR and MPV value between preeclampsia and normal pregnancy ($p = 0,584$ and $0,573$).

Conclusion: NLR value was significantly higher in preeclampsia compared to normal pregnancy. NLR also correlated with the increase of blood pressure in preeclampsia.

KEYWORDS: NLR, MPV, PLR, preeclampsia

INTRODUCTION

WHO (World Health Organization) defined maternal mortality as the death of a woman during pregnancy, parturition, or within 42 days after delivery. Maternal mortality had become a major aspect in Sustainable Development Goals (SDG's)2030, with its target of reducing Maternal Mortality Rate to under 70 per 100.000 live births. Current number of Maternal Mortality Rate in Indonesia is 346 per 100.000 per live births, indicating major problem in obstetric health in Indonesia. One of the leading cause of high maternal mortality in Indonesia is preeclampsia and its complications.^{1,2,3,4} Preeclampsia defined as pregnancy specific condition marked with placental dysfunction and maternal responses to systemic inflammation with endothelial and coagulation activation.⁵ Multiple organ dysfunction in preeclampsia demands a comprehensive management to achieve an optimal maternal and fetal outcome. Requirement for comprehensive preeclampsia management includes a state of the art laboratory and intensive care facility, two things that impedes preeclampsia management in Indonesia with its large and expansive territories. These facts shows that a simplified, cheap, and quick alternative method is required to diagnose and assessing the severity of preeclampsia in Indonesia. In preeclampsia, trophoblast invasion deficiency may cause placental hypoxia, secretion of proinflammatory cytokine and release of angiogenic and antiangiogenic factors. Alteration in immune system was researched extensively as one of the cause of preeclampsia, especially in its association with proinflammatory cytokine, neutrophil activation and endothelial dysfunction.⁶ Preeclampsia is a state of controlled inflammation. A theory suggests that enhanced systemic inflammatory response is the basis of systemic manifestation of preeclampsia, even though the exact mechanism was still unclear. All of maternal leucocyte components such as

neutrophil, lymphocyte and monocyte underwent activation in pregnancy, with a higher degree in preeclamptic patients. These activations were considered to have an association with vascular dysfunction in preeclampsia.^{7,8,9,10}

METHODS

This was an analytic study with Case Control design, conducted in December 2018 at Adam Malik General Hospital Medan. Data of the patients who fulfilled the inclusion and exclusion criterias were obtained from medical record. Inclusion criteria in this study were : pregnant woman in preeclampsia, singleton pregnancy, not have been diagnosed with diabetes, chronic hypertension, infectious diseases, history of renal disease, premature rupture of membrane and history of gynecological malignancies. Exclusion criterias were: incomplete medical record data and a history of blood transfusion. As control group, data from normal pregnancy patients (non-preeclamptic) was collected. The total population was 140 subjects, 70 with preeclampsia and 70 without preeclampsia.

RESULT AND DISCUSSION

From Table 1, mean age of subjects from control group was 27,49 years old (SD = 5,12) and 31,57 years old (SD = 5,24) in preeclampsia group with p -value 0,001. Mean BMI in control group was 24,98 (SD = 3,58), while mean BMI from the preeclampsia group was 24,38 (SD = 3,30) with p 0,306. Median of gestational age in control group was 38 weeks (min-max 35-40), and 37 weeks (min-max 30-40) from the preeclampsia group with p 0,001. Median birthweight in control group was 3200 gram (min-max 2470-3690), 2650 gram (min-max 1470-3760) from preeclampsia group with p 0,001. Median length of hospital stay was 2 days for control (min-max 2-6), and 4 days for preeclampsia group (min-max 2-17) with p 0,001.

Table 1. Comparison of Subjects Characteristics In Normal Pregnancy And Preeclampsia

Characteristic	Normal Pregnancy	Preeclampsia	p value
Maternal age, mean (SD)	27,49 (5,12)	31,57 (5,24)	0,001a
BMI, mean (SD)	24,98 (3,58)	24,38 (3,30)	0,306a
Gestational Age, median (min-max)	38 (35-40)	37 (30-40)	0,001b
Birthweight, median (min-max)	3200 (2470-3690)	2650 (1470-3760)	0,001b
C-Section , n (%)	13 (18,57)	54 (77,14)	1,000c
Length of stay, median (min-max)	2 (2-6)	4 (2-17)	0,001b

^aTIndependent, ^bMann Whitney, ^cFisher's Exact

Based on Table 2, median systolic blood pressure at admission in control group was 120 mmHg (min-max 100-140), from preeclampsia group 170 mmHg (min-max 140-220) with p 0,001. Median diastolic blood pressure at admission in control group was 80 mmHg (min-max 60-90), 100 mmHg (min-max 80-140) from preeclampsia group with p 0,001. Median systolic blood pressure at discharge in control group was 110 mmHg (min-max 100-130), 140 mmHg (min-max 110-170) from preeclampsia group with p 0,001. Median diastolic blood pressure at discharge in control group was 80 mmHg (min-max 60-90), 80 mmHg (min-max 70-100) from preeclampsia group with p 0,001. Median value of NLR in control group was 2,33 (min-max 0,77-6,64), 4,12 from preeclampsia (min-max 1,81-16,50) with p 0,001. Median of PLR in control group was 109,73 (min-max 32,66-480,23), 98,76 (min-max 4,26-470,21) in preeclampsia group with p 0,584. Mean of MPV in control group was 10,57 (SD = 1,12), 10,67 (SD = 0,97) in preeclampsia group with p 0,573. Mean level of hemoglobin in control group was 11,03 (SD = 1,56), 11,89 (SD = 1,59) in preeclampsia with p 0,002. Mean platelet level (x10³) in control group was 289,3 (SD = 76,10), 218,70 (SD = 93,77) from preeclampsia group with p 0,059.

Table 2. Comparison of Blood Pressure and Hematologic Parameter In Normal Pregnancy and Preeclampsia

Parameter	Normal Pregnancy	Preeclampsia	p value
Systolic BP at Admission median (min-max)	120 (100-140)	170 (140-220)	0,001a
Diastolic BP at Admission median (min-max)	80 (60-90)	100 (80-140)	0,001a
Systolic BP at Discharge median (min-max)	110 (100-130)	140 (110-170)	0,001a
Diastolic BP at Discharge median (min-max)	80 (60-90)	80 (70-100)	0,001a
NLR, median (min-max)	2,33 (0,77-6,64)	4,12 (1,81-16,50)	0,001a
PLR, median (min-max)	109,73 (32,66-480,23)	98,76 (4,26-470,21)	0,584a
MPV, mean (SD)	10,57 (1,12)	10,67 (0,97)	0,573b
Hb, mean (SD)	11,03 (1,56)	11,89 (1,59)	0,002b
Platelet (x10 ³), mean (SD)	289,30 (76,10)	218,70 (93,77)	0,059b

^aMann Whitney, ^bTIndependent

Kurt et al compared NLR value in preeclamptic patient and control group in a study, but no significant difference was found between the two groups.¹¹ However, in a study by Oylumlu et al, NLR was significantly higher in preeclamptic group compared to control group.¹¹ Serin et al also found the same results, NLR was higher in preeclampsia compared to normal pregnancy. Toptas et al found that PLR value was significantly lower in subjects with preeclampsia, and had an association with the degree of preeclampsia severity.¹² Altonbafl et al stated that MPV is not sufficient to predict preeclampsia or its severity.¹¹

CONCLUSION

No significant differences were found in PLR and MPV value between preeclampsia and normal pregnancy. Significantly higher NLR value was found in preeclampsia, indicating its role in the process of preeclampsia pathophysiology.

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