



Analysis of Platelet Index in Various Classifications of Hypertension in Pregnancy

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ABSTRACT

Hypertension in pregnancy is the fourth largest cause of maternal mortality in Indonesia. One classification of hypertension in pregnancy is preeclampsia. Thrombocytopenia is the most important sign indicating the severity of preeclampsia. 50% of preeclampsia cases are associated with thrombocytopenia. The aim of study is to analyze the Platelet Index in preeclampsia dan severe preeclampsia. This research used cross sectional and collecting platelet index data from medical records of patients with preeclampsia and severe preeclampsia, in RSUD Dr. Aloe Saboe Gorontalo, January 2020 - December 2023. The sample is 30 medical records of pregnant women who were diagnosed preeclampsia and severe preeclampsia. Used simple random sampling technique. The statistical analysis used Independent T test. Results: The average platelet level in pregnant women with preeclampsia is 252.6 ribu/uL, and severe preeclampsia is 191.467 ribu/uL. P value = 0.012 (<0.05) this shows that there is a difference in the average of the preeclampsia and severe preeclampsia groups. Conclusion: The platelet index of the preeclampsia group was higher than that of the severe preeclampsia group .

Keywords: Preeclampsia, Pregnancy, Platelet

INTRODUCTION

Platelet index is a blood-based parameter that reflects platelet activation and provides information on platelet size, variability, and number. Hypertension in pregnancy is the fourth largest cause of maternal mortality in Indonesia and a loss of 14.6% of the Maternal Mortality Rate (MMR) (Kemenkes RI, 2022). In Gorontalo province in 2021, hypertension was the highest cause of MMR, namely 10 cases (Gorontalo, 2022). One classification of hypertension in pregnancy is preeclampsia. Patients suffering from preeclampsia experience widespread endothelial dysfunction or blood vessel disorders resulting in vasospasm after 20 weeks of pregnancy. This causes decreased organ perfusion and endothelial activation, which causes hypertension, edema, and proteinuria (Javed et al., 2020). Preeclampsia begins with a failure in the second phase of trophoblast proliferation caused by genetic, immunological, and maladaptive cardiovascular changes (Dangana et al., 2021). Failure in the second phase is in the form of not all spiral arteries being invaded by trophoblast cells and changes in the blood vessels do not occur so that the spiral arteries remain small in diameter, easily vasospasm, reactive, and can even increase vascular reactivity. The result can be a disruption in blood flow in

the intervillous area which can cause the placenta to experience hypoxia and ischemia (Deshmukh et al., 2022). Placental ischemia produces free radicals that can cause the formation of lipid peroxides which will form toxic radicals and damage endothelial cells (Agbani et al., 2023). Placental ischemia will also be followed by the release of a number of vasoactive factors (TNF- α and IL) which can interfere with endothelial function, platelet function and change the balance of vasoconstriction and vasodilation of blood vessels (Chiu et al., 2021). The changes that occur include: (1) an increase in the thromboxane/prostacyclin ratio, (2) an increase in the release of endothelin-1 which is the main vasoconstrictor of blood vessels, (3) a decrease in nitric oxide synthesis which results in endothelial dysfunction with generalized vasoconstriction (Jasim Alhusaynei & Dhannoon Nayyef, 2024). The occurrence of blood vessel vasospasm causes damage to the integrity of the blood vessel endothelium, causing increased capillary permeability and blood plasma to shift into the interstitial space (Lin et al., 2023). Furthermore, plasma volume will decrease and hemoconcentration will occur which can be measured from an increase in hematocrit levels (Umezulike et al., 2021). Continuously increasing hemoconcentration will cause tissue

perfusion to decrease in all organs and reduce preeclampsia (Mahmoud et al., 2020). The vasospasm that occurs can also induce platelet aggregation and endothelial damage which causes platelet use, causing thrombocytopenia which is the most important marker of the severity of preeclampsia (Temur et al., 2021).

METHOD

This study was conducted in a descriptive retrospective manner by taking and collecting platelet index data from medical records of Preeclampsia and severe preeclampsia patients at Dr. Aloe Saboe Gorontalo Hospital for the period January 2020 - December 2023. The inclusion criteria were complete patient medical records. The population in this study was the medical records of pregnant women at Dr. Aloe Saboe Gorontalo Hospital for the period January 2020 - December 2023. The sample of this study was the medical records of 30 pregnant women diagnosed by clinicians as suffering from Preeclampsia and severe Preeclampsia who met the inclusion criteria. The Sampling technique was a simple random sampling technique. Location and Time of Research. This research was conducted at Dr. Aloe Saboe Gorontalo Hospital. The time of the study was carried out in 2024. Data Analysis. using Statistical Package Software for Social Science (SPSS)

version 25. Bivariate analysis using the Independent T-Test. The platelet index used in this study is platelet count (PLT) (Only paltelet count). The inclusion criteria used were pregnant patients who had been diagnosed by a doctor RSUD Aloe Saboe as having preeclampsia and severe preeclampsia. This research has received ethical approval with the number DP. 04.03/KEPK/ 109/2024.

RESULTS AND DISCUSSIONS

Result

The respondents in this study were 15 pregnant women with preeclampsia and 15 pregnant women with severe preeclampsia. The Independent T Test obtained a p value = 0.012 (<0.05) this shows in table 1 that there is a difference in the average of the preeclampsia and severe preeclampsia groups.

Table 1 Results Of Independent T Test Analysis

Group Statistics				
Kelompok	N	Mean	Std. Deviation	Std. Error Mean
Jafaka Tiandosa Preeklamsia	15	252.600	68.3632	17.6585
Preeklamsia Berat	15	191.467	55.7008	14.3818

The average platelet level in the preeclampsia group was 252.6 while the severe preeclampsia group was 191.467. This shows that the severe preeclampsia group has a lower platelet index than the preeclampsia group.

Discussion

The results of this study are in line with research conducted by Devi et al., 2024 which stated that platelet levels in pregnant women with hypertension are lower than in normotensive pregnant women (Edwin Obiorah et al., 2023). This is caused by coagulation disorders that are often detected in preeclampsia which occur due to endothelium injury to platelet activation, which can cause increased platelet consumption (Devi et al., 2024).

Preeclampsia in pregnancy is a widespread vascular endothelial dysfunction disorder that causes vasospasm after 20 weeks of pregnancy (Fuady et al., 2024). This causes decreased organ perfusion and endothelial activation, which causes hypertension, edema, and proteinuria of more than 300 mg per 24 hours or 30 mg/dl (+1 on the dipstick), with very different values when taking urine. When platelets are measured as mean platelet volume (MPV), their size indicates platelet activity (Fortuna Maudy Sintya et al., 2021). Larger platelets have higher prothrombotic potential, enzymatic activity, and metabolic activity (Safety, 2024). After placental ischemia, a number of vasoactive factors (TNF- α and IL) are released, which disrupt endothelial function, platelet function, and alter the balance between vasoconstriction and vasodilation. Placental ischemia in

preeclampsia will also be followed by the release of a number of vasoactive factors (TNF- α and IL) that can disrupt endothelial function, platelet function, and change the balance of vasoconstriction and vasodilation of blood vessels. The changes that occur include: (1) increased thromboxane/prostacyclin ratio, (2) increased release of endothelin-1 which is the main vasoconstrictor of blood vessels, (3) decreased synthesis of nitric oxide which results in endothelial dysfunction with generalized vasoconstriction. The occurrence of blood vessel vasospasm causes damage to the integrity of the blood vessel endothelium, causing increased capillary permeability and blood plasma shifting into the interstitial space. Furthermore, plasma volume will decrease and hemoconcentration will occur which can be measured from an increase in hematocrit levels. Continuous increase in hemoconcentration will cause decreased tissue perfusion in all organs and reduce preeclampsia. The vasospasm that occurs can also trigger platelet aggregation and endothelial damage that causes platelet use, resulting in thrombocytopenia which is the most important marker of the severity of preeclampsia. (Udeh et al., 2024). Free radicals are produced by placental ischemia, which causes the formation of lipid peroxides that damage endothelial cells (Hayuningsih et al., 2023)

(Mahmoud et al., 2020). In addition, vasospasm that occurs causes platelet aggregation and endothelial damage, which helps maintain platelet dysfunction and causes platelet use (Salvi et al., 2021) (Arslanoğlu et al., 2024). The most significant sign of the severity of preeclampsia is thrombocytopenia, which occurs in 50% of cases (Devi et al., 2024). Based on this reseach, the platelet index can be used as an early predictive biomarker for the severity of preeclampsia. The results of this study are the same as previous research which found that the more severe the preeclampsia, the higher the risk of thrombocytopenia, such as research from Reddy (2019) (Reddy & Rajendra Prasad, 2019).

CONCLUSION

The platelet index in the preeclampsia group was greater than in the severe preeclampsia group. The more severe the preeclampsia, the higher the potential for thrombocytopenia.

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