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 preeclaampsia 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, and severe preeclampsia is 191.467. 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 in the preeclampsia group was greater than in the severe preeclampsia group.
Keywords: Preeclampsia, Pregnancy, Platelet.

INTRODUCTION

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 (Gang et al., 2017). Preeclampsia begins with a failure in the second phase of trophoblast proliferation caused by genetic, immunological, and maladaptive cardiovascular changes. 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 (Thalor et al., 2019). 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 (Tolla et al., 2019). 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.

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 (Reddy & Rajendra Prasad, 2019).

METHOD AND MATERIAL

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.

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 that there is a difference in the average of the preeclampsia and severe preeclampsia groups. 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. 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. 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. Free radicals are produced by placental ischemia, which causes the formation of lipid peroxides that damage endothelial cells (Hayuningsih et al., 2023). In addition, vasospasm that occurs causes platelet aggregation and endothelial damage, which helps maintain platelet dysfunction and causes platelet use (Salvi et al., 2021). The most significant sign of the severity of preeclampsia is thrombocytopenia, which occurs in 50% of cases (Devi et al., 2024).

CONCLUSION

The platelet index in the preeclampsia group was greater than in the severe preeclampsia group.

REFERENCE

Agbani, E. O., Skeith, L., & Lee, A. (2023). Preeclampsia: Platelet procoagulant membrane dynamics and critical biomarkers. *Research and Practice in Thrombosis and Haemostasis*, *7*(2), 100075. https://doi.org/10.1016/j.rpth.2023.100075

Chiu, P. C., Chattopadhyay, A., Wu, M. C., Hsiao, T. H., Lin, C. H., & Lu, T. P. (2021). Elucidation of a Causal Relationship Between Platelet Count and Hypertension: A Bi-Directional Mendelian Randomization Study. *Frontiers in Cardiovascular Medicine*, *8*(November), 1–10. https://doi.org/10.3389/fcvm.2021.743075

Devi, D. A., Anwar, M., & Kartini, F. (2024). *Perbandingan kadar trombosit pada ibu hamil normotensi dengan ibu hamil hipertensi*. *15*(2), 54–63.

Fortuna Maudy Sintya, R., Dwi Ariningtyas, N., Nurida, A., & Salim Ambar, N. (2021). Comparison of Platelet Levels between Preeclampsia and Eclampsia Patients at Wiyung Sejahtera Hospital, Surabaya. *MAGNA MEDICA Berkala Ilmiah Kedokteran Dan Kesehatan*, *8*(1), 10. https://doi.org/10.26714/magnamed.8.1.2021.10-17

Fuady, D. R., Yudatmo, U., Ghazali, M. F., Rosdiana, D., & Arjadi, F. (2024). Correlation between platelet indices and preeclampsia with severe features. *Jurnal Kedokteran Dan Kesehatan Indonesia*, *273*, 37–47. https://doi.org/10.20885/jkki.vol15.iss1.art6

Gang, L., Yanyan, Z., Zhongwei, Z., & Juan, D. (2017). Association between mean platelet volume and hypertension incidence. *Hypertension Research*, *40*(8), 779–784. https://doi.org/10.1038/hr.2017.30

Gorontalo, D. P. (2022). *Profil Kesehatan Provinsi Gorontalo 2022*.

Hayuningsih, C., Lismayanti, L., & Tjandrawati, A. (2023). Comparison of Thrombocyte Indices and Immature Platelet between Preeclampsia and Normal Pregnancy. *Indonesian Journal of Clinical Pathology and Medical Laboratory*, *30*(1), 54–59. https://doi.org/10.24293/ijcpml.v30i1.2075

Kemenkes RI. (2022). Profil Kesehatan Indonesia 2021. In *Pusdatin.Kemenkes.Go.Id*.

Lin, S. S., Wang, C. R., Wei, D. M., Lu, J. H., Chen, X. J., Chen, Q. Z., Xia, X. Y., He, J. R., & Qiu, X. (2023). Incremental predictive value of platelet parameters for preeclampsia: results from a large prospective cohort study. *BMC Pregnancy and Childbirth*, *23*(1), 1–11. https://doi.org/10.1186/s12884-023-05661-y

Mahmoud, M., elshabrawi, A., Khalifa, N., & Ibrahim, S. (2020). Prediction of Preeclampsia by Measuring of Mean Platelet Volume and Platelet Distribution Width. *Zagazig University Medical Journal*, *0*(0), 0–0. https://doi.org/10.21608/zumj.2020.25158.1762

Reddy, S. G., & Rajendra Prasad, C. S. B. (2019). Significance of platelet indices as severity marker in nonthrombocytopenic preeclampsia cases. *Journal of Laboratory Physicians*, *11*(03), 186–191. https://doi.org/10.4103/jlp.jlp_161_18

Salvi, P., Gaikwad, V., & Ali, R. (2021). Clinical Correlation of Platelet Indices in Preeclamptic Patients without HELLP Syndrome. *International Journal of Pharmaceutical Sciences and Medicine*, *6*(3), 62–75. https://doi.org/10.47760/ijpsm.2021.v06i03.006

Thalor, N., Singh, K., Pujani, M., Chauhan, V., Agarwal, C., & Ahuja, R. (2019). A correlation between platelet indices and preeclampsia. *Hematology, Transfusion and Cell Therapy*, *41*(2), 129–133. https://doi.org/10.1016/j.htct.2018.08.008

Tolla, N., Perdana, N., Salsa, A., & Faidah, N. (2019). Analisis Indeks Trombosit dan Rasio Trombosit Limfosit sebagai Penanda Kerusakan Ginjal pada Penderita Hipertensi

Berbagai Derajat Analysis Platelet Indices and Platelet Lymfosit Ratio as A Kidney Damage Marker in Degree of Hipertensi dikenal dengan istil. *Medica Arteriana*, *1*(2), 1–8.