ÖZGÜN ARAŞTIRMA / ORIGINAL ARTICLE

Mean platelet volume: A potential indicator for preeclampsia

Ortalama trombosit hacmi: Preeklampsi için potansiyel bir gösterge

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ABSTRACT

Aim: This retrospective study aims to determine the frequency of thrombocytopenia in infants born to mothers with pregnancy-induced hypertension characterized by high blood pressure and proteinuria, such as preeclampsia. Additionally, the thrombocytopenic infants' platelet volumes (MPV) will be compared to those of infants born from normal pregnancies. The results of this study can provide insights into the health status of infants experiencing thrombocytopenia during the pregnancy process. Moreover, the relationship between thrombocytopenia and MPV will be examined, and understanding this relationship will help us better comprehend the impact of thrombocytopenia.

Methods: This retrospective study aims to determine the differences in platelet counts and mean platelet volume (MPV) between newborns of preeclamptic mothers who develop thrombocytopenia and those who do not, as well as newborns from normal pregnancies. To attain this objective, a total of 60 infants with comparable gestational ages were segregated into three distinct groups. Exclusion criteria included multiple pregnancies, fetal anomalies, and maternal comorbidities. Control group participants were matched for gestational age and excluded based on similar criteria. The first group comprised 20 infants born to mothers suffering from preeclampsia who exhibited thrombocytopenia (Group A), the second group included 20 infants born to mothers with preeclampsia but without thrombocytopenia (Group B), and the third group consisted of 20 infants born to mothers with uncomplicated pregnancies (Group C). Using hematological data obtained from medical records, the newborns' birth weights, platelet counts, and MPVs were compared according to the first 72 hours of life. These analyses aimed to determine the impact of thrombocytopenia on newborns' birth weights and platelet counts and to investigate the relationship between thrombocytopenia and MPV. Preeclampsia was diagnosed based on guidelines established by the American College of Obstetricians and Gynecologists (ACOG).

Results: According to the findings of this study, it was observed that as the platelet count decreased in newborns of preeclamptic mothers with thrombocytopenia, mean platelet volume (MPV) values increased. In Group A infants, where platelet counts were the lowest, the highest MPV values were observed. The statistically significant decrease in platelet count in Group A was observed (p<0.01). However, statistical analysis revealed no significant correlation between MPV and platelet counts. Additionally, no significant difference was detected between the groups in terms of MPV values (p=0.053).

Conclusion: This study highlights the potential role of MPV in preeclampsia-related thrombocytopenia. However, the lack of a significant correlation between MPV and platelet count suggests that thrombocytopenia alone is insufficient as an indicator, and platelet function must also be considered. Further prospective studies are needed to confirm these findings.

Keywords: Preeclampsia, mean platelet volume, platelet count.

ÖZ

Amaç: Bu retrospektif çalışma, preeklampsi gibi gebelik hipertansiyonu ve proteinüri ile karakterize bir hastalığı olan annelerin bebeklerinde trombositopeni görülme sıklığını belirlemeyi hedeflemektedir. Ayrıca, trombositopeninin etkisi altında kalan bebeklerin trombosit hacimlerinin (MPV) normal gebeliklerden doğan bebeklerin MPV'si ile karşılaştırılması planlanmaktadır. Bu çalışmanın sonuçları, gebelik sürecinde trombositopeni ile karşılaşan bebeklerin sağlık durumları hakkında fikir verebilecektir. Ayrıca, trombositopeninin MPV ile ilişkisi incelenecek ve bu ilişkinin aydınlatılması, trombositopeninin etkisini daha iyi anlamamızı sağlayacaktır.

Yöntem: Bu araştırma, trombositopeni gelişen ve gelişmeyen preeklamptik annelerin bebekleri ile normal gebeliklerden doğan bebeklerin trombosit sayıları ve MPV'leri arasındaki farkları belirlemeyi amaçlamaktadır. Çalışma için lokal etik kurulun 129 nolu onayı temin edilmiştir. Bu doğrultuda, gebelik yaşı benzer olan 60 yenidoğan bebek, üç gruba ayrılmıştır: trombositopeni gelişen 20 preeklamptik anne bebeği (Grup A), trombositopeni gelişmeyen 20 preeklamptik anne bebeği (Grup B) ve trombositopeni gelişmeyen 20 normal anne bebeği (Grup C). Bu çalışmada, tıbbi kayıtlardan elde edilen hematolojik veriler kullanılarak, bebeklerin doğum ağırlıkları, trombosit sayıları ve MPV'leri, yaşamın ilk 72 saati içindeki süreçlerine göre karşılaştırılmıştır. Bu analizler, trombositopeninin bebeklerin doğum ağırlığı ve trombosit sayısı üzerindeki etkisini belirlemek ve trombositopeni ile MPV arasındaki ilişki incelenmiştir.

Bulgular: Bu çalışmanın bulgularına göre, trombositopeni gelişen preeklamptik annelerin bebeklerinde, trombosit sayısı düştükçe MPV değerlerinin arttığı gözlemlenmiştir. Grup A bebeklerinde, trombosit sayılarının en düşük olduğu ve MPV değerlerinin en yüksek olduğu görülmüştür. Ancak, yapılan istatistiksel analizler sonucunda, MPV ve trombosit sayıları arasında anlamlı bir korelasyon saptanmamıştır. Ayrıca, MPV değerleri açısından gruplar arasında anlamlı bir fark tespit edilememiştir (p=0.053).

Sonuç: Preeklamptik annelerin bebeklerinde trombositopeni gelişme olasılığının artmasıyla birlikte, trombositlerin hacimlerinin değişebileceğini ve bu durumun MPV değerlerini etkileyebileceğini göstermektedir. Ancak, MPV ve trombosit sayıları arasındaki korelasyonun bulunmaması, trombositopeni olgusunun tek başına yeterli bir gösterge olmadığını ve trombositlerin fonksiyonlarına da dikkat edilmesi gerektiğini vurgulamaktadır. Bu nedenle, bu bulgular, preeklamptik annelerin bebeklerinde trombositopeni gelişme durumunda, hem trombosit sayılarının hem de fonksiyonlarının takip edilmesinin önemini ortaya koymaktadır. Trombosit hacmindeki artış, trombosit yıkımının bir göstergesi olarak kabul edilirken, azalma ise trombosit yapımındaki yetersizliğin bir göstergesi olarak kabul edilir. Bu çalışmanın sonuçları, preeklamptik anne bebeklerinde görülen trombositopeni durumunun etiyolojisinin sadece trombosit hacmi ile açıklanamayacağını ortaya koymaktadır. Bu durum, trombositopeninin nedeninin sadece trombositlerin azalması veya yıkımı olmayabileceğini düşündürmektedir. Başka faktörler de trombositopeni gelişimine katkıda bulunabilir. Bu nedenle, trombosit hacmi tek başına bir gösterge olarak kullanılamaz ve trombosit yapım ve yıkımının yanı sıra diğer faktörlerin de dikkate alınması gerekmektedir. Sonuç olarak, preeklamptik anne bebeklerinde trombositopeninin nedenleri hakkında daha fazla araştırma yapılması gerekmektedir.

Anahtar Kelimeler: Preeklampsi, orta trombosit hacmi, trombosit sayısı

INTRODUCTION

Preeclampsia and eclampsia are two conditions that can affect pregnancies, occurring in up to 10% of cases, and are characterized by high blood pressure, proteinuria, and/or edema. The underlying cause of these conditions is still not fully understood (1). Newborns are at risk of preterm birth and fetal growth restriction, which are the most significant risk factors. The mother's blood vessels may have abnormalities due to a lack of proper invasion of the placenta by trophoblastic cells (2). This can lead to damage to the maternal endothelial cells and a decrease in placental perfusion, which can be attributed to various mediators in circulation (2). In normal pregnancies, platelet volume increases as platelet synthesis increases. Changes in platelet function are detected more readily by evaluating platelet volume rather than count (2). The primary pathophysiological processes that occur in preeclampsia involve alterations in circulation, damage to endothelial cells, activation of platelets, and a rise in intravascular thrombin formation (3). Maternal platelet count, volume, and function are known to be affected in preeclampsia, possibly as a result of vascular activation. Thrombocytopenia and neutropenia are common in newborns born to preeclamptic mothers, which may be due to decreased platelet and leukocyte production due to placental insufficiency (4). Early thrombocytopenia in preeclamptic mothers may be caused by placental insufficiency due to maternal hypertension. This study aims to compare the mean platelet volume (MPV) of infants born to mothers with preeclampsia and normal pregnancies, and to examine the correlation between MPV and thrombocytopenia in infants born to mothers with preeclampsia.

MATERIAL AND METHODS

The present study retrospectively evaluated a total of 60 cases, including 20 neonates born to preeclamptic mothers with thrombocytopenia (Group A), 20 neonates born to preeclamptic mothers without thrombocytopenia (Group B), and 20 neonates born to normal mothers without thrombocytopenia (Group C). This retrospective study received approval from the local ethics committee for clinical research at local ethics comitee. (2021-129) Informed consent was not obtained from the patients as it was deemed unnecessary in the retrospective study. The medical records of the mothers of neonates diagnosed with preeclampsia were retrospectively reviewed. The diagnosis of preeclampsia was established based on the history, obstetric examination, and laboratory investigations, and was defined as having a systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg or a mean arterial pressure >105 mmHg, proteinuria of at least +1 on dipstick analysis or >300 mg in a 24-hour urine collection, after 20 weeks of gestation.

The cases were compared retrospectively in terms of birth weight, platelet counts, and mean platelet volume (MPV). The normal range for MPV was defined as 6.5-11.6 fL. Platelet and MPV values obtained within the first 72 hours after birth were considered for comparisons in all groups. Statistical analysis was carried out using SPSS 10.0 software. The data were presented as mean±SD. One-way ANOVA and Kruskal-Wallis tests were used for comparison among the three groups, followed by Mann-Whitney U test for comparison between two groups if there was significance. The relationship between two continuous variables was determined using Spearman's correlation coefficient. A P-value less than 0.05 was considered statistically significant.

RESULTS

The data in Table 1 displays the average gestational ages, birth weights, platelet counts, and MPV values for groups A, B, and C. A significant statistical distinction was observed between the platelet counts of the three groups, with group A showing a considerably lower platelet count than groups B and C (p<0.001). Although group A exhibited a higher MPV value in comparison to the other two groups, no significant difference was detected among the groups (p=0.053). Despite a numerical trend of decreasing MPV values with increasing platelet counts, there was no significant correlation found between platelet count and MPV value (p=0.163, R=-0.166).

Table 1. Comparison of the groups.

	Group A	Group B	Group C	P*
Gestational Age› (weeks)	34.2±2.34	35.2±2.43	33.5±3.4	0,08
Birth Weight	1762±597	2176±759	2181±653	0,09
Platelet (thousand/mm³)	112±27	248±103	274±107	<0,01
MPV (fL)β	7,96±0,78	7,81±0,64	7,41±0,66	0,053

* Mean±SD
** p<0,05 significance

DICUSSSION

Preeclampsia is a prevalent complication during pregnancy that results in various symptoms due to impaired placental perfusion and maternal endothelial cell damage by circulating mediators(5). Thrombocytopenia is one such symptom that may arise due to vasoconstriction and decidual thrombosis in uteroplacental vessels or reduced production of growth factors such as VEGF and PIGF, which normally aid in megakaryocyte maturation during pregnancy but are diminished in preeclampsia.(5) In neonates,

thrombocytopenia may result from placental insufficiency, maternal vascular dysfunction, or decreased megakaryocyte production. Additionally, increased platelet destruction due to oxidative stress and inflammatory mediators may play a role.

Historically, an increase in mean platelet volume (MPV) has been associated with heightened platelet production. Elevated MPV levels have been linked to increased platelet production in normal pregnancies (6). However, studies investigating platelet counts and MPV values in preeclamptic versus normal pregnancies have produced varied outcomes. There is some variation among research findings regarding platelet counts and MPV values in women with preeclampsia when compared to control groups (7). Certain studies report no significant statistical differences in these measures, while others show lower platelet counts and higher MPV values in women with preeclampsia (8,9). Despite being a well-known complication of preeclamptic pregnancies, the exact cause of thrombocytopenia remains a mystery. Additionally, the underlying cause of thrombocytopenia in both preeclamptic mothers and their infants is not fully understood (10). Only three studies to date have attempted to investigate the cause of low platelet counts in these infants. However, no thrombocytopenia was found in infants with abnormal test results. The relationship between thrombocytopenia and mean platelet volume (MPV) in preeclamptic mother and baby has yet to be studied in medical literature (11,12). Therefore, we aimed to investigate whether MPV could serve as an indicator of thrombocytopenia in this population. Our study is the first to explore this relationship. Although we observed that the MPV value was higher in preeclamptic mother and baby with thrombocytopenia compared to those without thrombocytopenia and healthy babies, the difference was not statistically significant (p: 0.053). Interestingly, we noted that as the platelet count decreased among the groups, the MPV value increased. Although the results did not reach statistical significance, the highest MPV value was found in thrombocytopenic babies, and the increase in MPV as the platelet count decreased among the groups suggests that thrombocytopenia in preeclamptic mother and baby may be more closely associated with destruction.

CONCLUSION

In order to gain a deeper understanding of the mechanisms underlying thrombocytopenia in preeclamptic mothers and their infants, it may be beneficial to conduct a prospective study that includes additional variables. For instance, thrombopoietin values in preeclamptic mothers and their platelet counts, as well as MPV and thrombopoietin values, could be assessed in a prospective study. By doing so, we could potentially shed light on the causes of thrombocytopenia in preeclamptic pregnancies, which in turn could inform the development of more effective preventative and treatment strategies for mothers and their infants. This study aimed to explore MPV as a potential marker of thrombocytopenia in preeclamptic pregnancies. The findings suggest that while MPV values increase with thrombocytopenia, additional factors such as platelet function and destruction mechanisms need further investigation. This contributes to a better understanding of platelet dynamics in preeclampsia. While this study was conducted retrospectively by analyzing file data, a prospective study that includes a broader range of variables could provide more detailed insights into this complex condition.

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