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Association Between Platelet Count and Platelet Indices with Postpartum Blood Loss After Vaginal Delivery

Trombosit Sayısı ve İndekslerinin Vajinal Doğum Sonrası Postpartum Kan Kaybı ile İlişkisi

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Abstract

Objective: The aim of this study was to evaluate the predictive value of antepartum platelet count (PLT) and platelet indices in predicting postpartum hemoglobin (Hb) decline among women undergoing low-risk spontaneous vaginal delivery.

Method: This retrospective observational cohort study enrolled women who underwent term (≥37 weeks) spontaneous vaginal delivery at a tertiary referral center between 2023 and 2024, excluding those with identifiable obstetric or medical risk factors for postpartum hemorrhage. PLT and platelet indices—specifically mean platelet volume, platelet distribution width, plateletcrit and platelet-large cell ratio—measured at the time of admission were recorded. The primary outcome was the absolute postpartum Hb decline (ΔHb) measured 6 hours after delivery. Participants were stratified according to ΔHb thresholds of ≥1.0 g/dL and ≥1.5 g/dL.

Results: A total of 93 parturients meeting the eligibility criteria were analyzed. Neither PLT nor any of the platelet indices demonstrated a statistically significant association with postpartum Hb decline across either ΔHb threshold (all p>0.05). Both correlation and the receiver operating characteristic analyses demonstrated that these platelet parameters lacked discriminatory predictive value. In the multivariable logistic regression analysis, episiotomy was independently associated with ΔHb ≥1.5 g/dL (adjusted odds ratio: 4.354; 95% confidence interval: 1.596-11.881; p=0.004).

Öz

Amaç: Bu çalışmanın amacı, düşük riskli spontan vajinal doğum yapan gebelerde doğum öncesi trombosit sayısı (PLT) ve trombosit indekslerinin postpartum hemoglobin (Hb) düşüşünü öngörmedeki klinik değerini değerlendirmektir.

Yöntem: Bu retrospektif gözlemsel kohort çalışmasına, 2023-2024 yılları arasında üçüncü basamak bir merkezde term (≥37 hafta) spontan vajinal doğum yapan ve postpartum hemoraji açısından ek obstetrik veya medikal risk faktörü bulunmayan olgular dahil edildi. Doğum öncesi başvuru anında ölçülen PLT ve trombosit indeksleri (ortalama trombosit hacmi, trombosit dağılım genişliği, trombositkrit ve büyük trombosit oranı kaydedildi. Primer sonlanım noktası, doğumdan 6 saat sonra ölçülen mutlak postpartum Hb düşüşü (ΔHb) olarak belirlendi. Olgular ΔHb ≥1,0 g/dL ve ≥1,5 g/dL eşik değerlerine göre sınıflandırıldı.

Bulgular: Çalışmaya dahil edilme kriterlerini karşılayan toplam 93 olgu analiz edildi. PLT ve trombosit indekslerinin hiçbiri, her iki ΔHb eşik değeri için postpartum Hb düşüşü ile anlamlı ilişki göstermedi (tümü p>0,05). Korelasyon ve ROC analizleri, trombosit parametrelerinin ayırt edici bir öngörü performansına sahip olmadığını ortaya koydu. Çok değişkenli lojistik regresyon analizinde, epizyotomi uygulanması ΔHb ≥1,5 g/dL ile bağımsız olarak ilişkili bulundu (düzeltilmiş olasılık oranı: 4,354; %95 güven aralığı: 1,596-11,881; p=0,004).

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Abstract

Conclusion: In low-risk vaginal deliveries, the clinical utility of antepartum PLT and platelet indices for predicting postpartum Hb decline is limited. Conversely, episiotomy emerges as the most significant determinant of postpartum blood loss. These findings suggest that, in this patient population, postpartum bleeding is more closely associated with potentially modifiable obstetric interventions than with underlying biological susceptibility.

Keywords: Episiotomy, parturition, platelet function tests, postpartum hemorrhage

Öz

Sonuç: Düşük riskli vajinal doğumlarda, prepartum PLT ve trombosit indekslerinin postpartum Hb düşüşünü öngörmedeki klinik değeri sınırlıdır. Buna karşın epizyotomi, postpartum kan kaybının en güçlü belirleyicisi olarak öne çıkmaktadır. Bu bulgular, bu hasta grubunda postpartum kanamanın biyolojik yatkınlıktan ziyade potansiyel olarak değiştirilebilir obstetrik müdahalelerle ilişkili olduğunu düşündürmektedir.

Anahtar kelimeler: Doğum, epizyotomi, trombosit fonksiyon testleri, postpartum hemoraji

Introduction

Postpartum hemorrhage (PPH) is widely recognized as one of the most critical obstetric emergencies because of its unpredictable clinical course and potentially life-threatening -consequences; it continues to represent a leading cause of maternal morbidity and mortality on a global scale. According to World Health Organization definitions, PPH refers to blood loss of ≥500 mL occurring within the first 24 hours following vaginal delivery (1). Despite this standardized definition, routine clinical assessment of blood loss volume still relies predominantly on visual estimation, a method with inherently limited accuracy and reproducibility. Evidence from the literature indicates that visual estimation is associated with an error margin approaching 46% on average and exhibits a systematic bias pattern that is inversely proportional to the actual volume of blood loss (2). In this context, massive hemorrhages tend to be systematically underestimated, whereas relatively low-volume bleeding episodes tend to be overestimated. Given these diagnostic uncertainties, assessing the hemodynamic consequences of hemorrhage based on changes between pre- and postpartum hemoglobin (Hb) levels, rather than on subjective volumetric estimates, offers a more objective and reliable approach to predicting clinical outcomes (3,4).

Although the physiology of pregnancy is characterized by a hypercoagulable state aimed at limiting hemorrhagic losses during the peripartum period, interindividual variations in the hemostatic profile are recognized to exert a decisive influence on clinical prognosis (5,6). In this context, platelet count (PLT) is not confined to its numerical magnitude alone but serves as a critical determinant of hemostatic capacity through platelet activation and morphological dynamics (7). Mean platelet volume (MPV) and platelet distribution width (PDW) are considered indirect markers reflecting platelet activation status, degranulation processes, and cellular heterogeneity (7,8). In contrast, plateletcrit (PCT) is defined as a parameter that integrates PLT and platelet volume, thereby representing the total circulating platelet mass (9). Additionally, the platelet-large cell ratio (P-LCR) denotes the proportion of large, functionally active platelets in circulation and offers complementary insight into overall hemostatic potential (8). When analyzed within a comprehensive framework, these platelet indices may offer a more refined and informative biomarker profile for evaluating hemostatic processes compared with conventional PLT alone.

The existing literature reports heterogeneous findings regarding the predictive efficacy of PLT and its derivative indices for stratifying PPH risk. While some studies have identified lower MPV and PDW values as associated with increased bleeding volume, others have reported that these parameters lack sufficient discriminatory power to serve as independent risk factors (10-12). The primary objective of the present study was to assess the performance of antepartum PLT and platelet indices in predicting postpartum Hb decline among women undergoing low-risk -spontaneous vaginal delivery.

Materials and Methods

Study Design

This investigation was conducted as a retrospective observational cohort study designed to examine the association between prepartum platelet parameters and postpartum changes in Hb levels. Without of any diagnostic or therapeutic interventions, the research was conducted using data acquired during routine clinical practice. The research protocol was implemented in accordance with the ethical principles outlined in the Declaration of Helsinki and was approved by the Local Clinical Research Ethics Committee of University of Health Sciences Turkey, Başakşehir Çam and Sakura City Hospital (approval no: KAEK/21.05.2025.180, date: 30.05.2025).

Due to the retrospective design of the study, informed consent was not obtained from the patients. The study was conducted using data retrieved from the hospital database.

Setting

This research was conducted in the Department of Obstetrics and Gynecology at University of Health Sciences Turkey, Başakşehir Çam and Sakura City Hospital, a tertiary referral center. The study evaluated delivery cases managed at the institution between 2023 and 2024. Throughout this period, obstetric care and monitoring were provided in strict adherence to the clinical protocols at our center.

Participants

This investigation enrolled patients with a maternal age ranging from 18 to 40 years who underwent term (≥37 weeks of gestation) spontaneous vaginal delivery at our clinic during the predefined study period. Inclusion criteria were defined as singleton pregnancy, vertex presentation, and the absence of maternal anemia in the antepartum period (Hb <11 g/dL). Exclusion criteria included prior uterine surgery; multiple gestation; body mass index (BMI) >35 kg/m^2; preeclampsia or gestational hypertension; pregestational diabetes or gestational diabetes mellitus; active bacterial infection (including chorioamnionitis); development of grade 3-4 perineal lacerations during delivery or deliveries complicated by massive hemorrhage; receipt of blood transfusion in the peripartum period; placental pathologies (placental abruption, placenta previa, and placenta accreta spectrum disorders); and cases with incomplete clinical data.

Variables

The primary outcome variable was defined as the absolute decline in Hb level (ΔHb) measured at 6 hours postpartum. In the present study, ΔHb was used as a surrogate marker of postpartum blood loss, rather than as a direct volumetric measurement of PPH. Independent variables included PLT, PCT, -MPV, PDW, and PLCR, as well as coagulation parameters, including prothrombin time (PT), activated partial thromboplastin time (aPTT), and international normalized ratio (INR). In addition, maternal age, gravida, parity, and BMI were recorded as demographic variables.

Data Sources/Measurement

Relevant clinical and demographic variables, alongside laboratory parameters, were retrieved retrospectively from the institutional digital database. Antepartum parameters—including Hb, hematocrit, white blood cell count, PLT, and platelet indices (MPV, PDW, PCT, P-LCR), as well as coagulation profiles (PT, aPTT, INR)—were recorded at hospital admission for delivery. Postpartum Hb levels were determined via complete blood count (CBC) results obtained 6 hours following parturition. ΔHb was calculated as the difference between prepartum and postpartum Hb levels. For analytical purposes, patients were stratified according to predefined Hb decline thresholds (ΔHb ≥1.0 g/dL and ≥1.5 g/dL).

Bias

To minimize selection bias, predefined inclusion and exclusion criteria were applied, and all eligible cases within the specified study period were included. To limit information bias, data for all laboratory parameters used during the study period were obtained from the institution's central laboratory, which used standardized analytical methods.

Study Size

The sample size was determined through an a priori power analysis using G*Power 3.1 software (Heinrich Heine University Düsseldorf, Germany) (13). Based on the study by Ozturk et al. (10), the required sample size was calculated to be 64 participants, setting the Type I error probability (α) at 0.05 and the study power (1-β) at 0.80.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). The distribution characteristics of continuous variables were evaluated using the Kolmogorov–Smirnov test. Regarding descriptive statistics, normally distributed data were depicted as mean ± standard deviation, whereas data not following a normal distribution were reported as median (minimum-maximum). Between-group comparisons were conducted using the Student's t-test or the Mann-Whitney U test, as appropriate, based on distributional characteristics. Categorical variables were expressed as counts and percentages (%), and the chi-square test was employed for comparisons between groups. The association between platelet parameters and Hb decline was evaluated using Spearman correlation analysis. The discriminatory performance of platelet indices in predicting Hb decline was assessed using receiver operating characteristic (ROC) curve analysis. A multivariable binary logistic regression model was utilized to identify predictors of an Hb decline ≥1.5 g/dL. Model fit was assessed using the Hosmer-Lemeshow goodness-of-fit test. In all statistical analyses, a two-sided p-value <0.05 was considered statistically significant.

Results

During the predefined study period, cases of spontaneous vaginal delivery at our clinic were retrospectively reviewed. After application of the strict exclusion criteria specified in the study protocol, 93 patients who met the inclusion criteria and had complete data constituted the final study cohort.

The baseline characteristics and laboratory parameters of the study cohort were stratified according to Hb change thresholds (ΔHb ≥1 g/dL and <1 g/dL) and are presented in Table 1. No statistically significant differences were observed between the groups with respect to maternal age, BMI, Turkish ethnicity, birth weight, or gestational age at delivery (all p>0.05). In contrast, gravida and parity were significantly higher in the group with an Hb decline of <1 g/dL (all p<0.001). The rate of episiotomy was significantly higher in the group with an Hb decline of ≥1 g/dL, whereas no statistically significant difference was identified between the groups in terms of labor induction rates. With regard to hematologic parameters—including baseline Hb levels at the onset of labor, PLT, platelet indices (PCT, MPV, PDW, and P-LCR), and coagulation parameters (PT, aPTT, and INR)—no significant intergroup variation was observed (all p>0.05).

The comparative analysis of groups with and without a postpartum Hb decline of ≥1.5 g/dL is presented in Table 2. The groups had similar distributions in maternal age, BMI, Turkish ethnicity, birth weight, gestational age, and labor induction (all p>0.05). In contrast, statistically significant intergroup differences were detected in gravidity and parity (p=0.003 and p=0.004, respectively). Furthermore, the frequency of episiotomy was significantly higher in the group exhibiting an Hb decline ≥1.5 g/dL (p=0.003). Upon evaluation of the laboratory data, PLT, platelet indices, and coagulation profiles demonstrated comparable distributions in both groups (all p>0.05).

Spearman correlation analysis, conducted to examine the association between PLT, platelet indices, and ΔHb, revealed no statistically significant relationship (all p>0.05). Similarly, ROC analyses evaluating the diagnostic

Table 1. Comparison of demographic, obstetric, and laboratory characteristics according to postpartum hemoglobin decrease ≥1 g/dL

	Hemoglobin decrease <1 g/dL (n=40)	Hemoglobin decrease ≥1 g/dL (n=53)	p
Age (years)	26.5 (18-40)	26 (18-42)	0.706
BMI (kg/m^2)	28.3±3.8	29.3±5.07	0.280
Turkish ethnicity	34 (85.0%)	40 (75.5%)	0.259
Gravidity	2 (1-5)	1 (1-5)	**<0.001**
Parity	1 (0-4)	0 (0-3)	**<0.001**
GA at delivery (days)	277 (259-287)	274 (259-287)	0.275
Birth weight (g)	3157.25±460.91	3267.70±378.32	0.208
Episiotomy	13 (32.5%)	39 (73.6%)	**<0.001**
Labor induction	12 (30.0%)	11 (20.8%)	0.306
Hb (g/dL)	12.2±0.8	12.3±1.0	0.475
HCT (%)	35.5 (32.0-41.9)	36.4 (31.8-43.1)	0.061
PLT (10^3/μL)	236.2±59.7	251.0±74.3	0.302
PCT (%)	0.25±0.05	0.27±0.06	0.157
MPV (fL)	10.92±0.88	11.02±1.01	0.587
PDW (%)	13.29±2.35	13.68±2.88	0.487
P-LCR (%)	32.32±7.23	32.65±8.18	0.839
PT (s)	8.3 (7.1-11.0)	8.0 (7.3-9.2)	0.173
aPTT (s)	25.20±2.78	25.24±2.98	0.949
INR	0.9 (0.8-1.2)	0.9 (0.8-1.0)	0.104
Hb difference (ΔHb)	0.5 (0.1-0.9)	1.5 (1.0-2.7)	**<0.001**

Data are presented as mean ± standard deviation, median (minimum-maximum), or number (percentage), as appropriate. Bold values indicate statistical significance (p<0.05). BMI: Body mass index, GA: Gestational age, Hb: Hemoglobin, HCT: Hematocrit, PLT: Platelet count, PCT: Plateletcrit, MPV: Mean platelet volume, PDW: Platelet distribution width, P-LCR: Platelet large cell ratio, PT: Prothrombin time, aPTT: Activated partial thromboplastin time, INR: International normalized ratio

performance of PLT and platelet indices in predicting bleeding risk at both Hb decline thresholds (≥1 g/dL and ≥1.5 g/dL) did not yield any area under the curve values with meaningful discriminatory capacity.

A multivariable binary logistic regression analysis was conducted to identify factors associated with a postpartum Hb decline of ≥1.5 g/dL (Table 3). The analysis revealed that episiotomy was independently associated with the outcome variable [adjusted odds ratio (OR): 4.354; 95% confidence interval (CI): 1.596-11.881; p=0.004]. Conversely, BMI did not exhibit a statistically significant association (adjusted OR: 1.103; 95% CI: 0.997-1.220; p=0.054). Model calibration was assessed using the Hosmer-Lemeshow goodness-of-fit test, which indicated good model fit (p=0.858). Furthermore, PLT and platelet indices (MPV, PCT, PDW, and P-LCR) were not retained in the final regression model because they did not demonstrate statistically significant independent associations during model selection.

Discussion

Principal Findings

The primary objective of the present investigation was to assess the relationship between antepartum PLT and platelet indices and postpartum Hb decline among women undergoing spontaneous vaginal delivery. The findings demonstrated that PLT and platelet indices were not significantly associated with either ΔHb ≥1 g/dL or ΔHb

Table 2. Comparison of demographic, obstetric, and laboratory characteristics according to postpartum hemoglobin decrease ≥1.5 g/dL

	Hemoglobin decrease <1.5 g/dL (n=62)	Hemoglobin decrease ≥1.5 g/dL (n=31)	p
Age (years)	26 (18-40)	26 (18-42)	0.928
BMI (kg/m^2)	28.2±4.3	30.2±4.9	0.054
Turkish ethnicity	50 (80.6%)	24 (77.4%)	0.716
Gravidity	1 (1-5)	1 (1-5)	**0.003**
Parity	1 (0-4)	0 (0-3)	**0.004**
GA at delivery (days)	275 (259-287)	275 (261-287)	0.674
Birth weight (g)	3184.16±444.40	3292.26±352.00	0.241
Episiotomy	28 (45.2%)	24 (77.4%)	**0.003**
Labor induction	18 (29.0%)	5 (16.1%)	0.174
Hb (g/dL)	12.2 (11.1-14.5)	12.1 (11.0-14.3)	0.374
HCT (%)	36.1 (32.0-43.1)	36.3 (31.8-42.1)	0.429
PLT (10^3/μL)	232.5 (102-463)	248 (131-464)	0.168
PCT (%)	0.25±0.05	0.28±0.07	0.078
MPV (fL)	11.01±0.91	10.92±1.05	0.668
PDW (%)	13.50±2.40	13.53±3.15	0.959
P-LCR (%)	33.05±7.33	31.44±8.55	0.348
PT (s)	8.27±0.62	8.09±0.49	0.173
aPTT (s)	25.19±2.86	25.29±2.97	0.878
INR	0.9 (0.8-1.2)	0.9 (0.8-1.0)	0.397
Hb difference (ΔHb)	0.7 (0.1-1.4)	1.7 (1.5-2.7)	**<0.001**

Data are presented as mean ± standard deviation, median (minimum-maximum), or number (percentage), as appropriate. Bold values indicate statistical significance (p<0.05) BMI: Body mass index, GA: Gestational age, Hb: Hemoglobin, HCT: Hematocrit, PLT: Platelet count, PCT: Plateletcrit, MPV: Mean platelet volume, PDW: Platelet distribution width, P-LCR: Platelet large cell ratio, PT: Prothrombin time, aPTT: Activated partial thromboplastin time, INR: International normalized ratio

Table 3. Multivariable binary logistic regression analysis for predictors of postpartum hemoglobin decrease ≥1.5 g/dL

Variable	B	Adjusted OR [Exp(B)]	95% CI for OR	p
BMI (kg/m^2)	0.098	1.103	0.997-1.220	0.054
Episiotomy (present)	1.471	4.354	1.596-11.881	**0.004**

The multivariable model was adjusted for BMI and episiotomy. Hosmer-Lemeshow goodness-of-fit test indicated a good model fit (p=0.858). Bold values indicate statistical significance (p<0.05). B: Regression coefficient, OR: Odds ratio, CI: Confidence interval, BMI: Body mass index

≥1.5 g/dL thresholds. In addition, platelet parameters did not exhibit discriminatory prognostic value in correlation analyses with ΔHb, nor in ROC analyses assessing their diagnostic performance. In contrast, multivariable analysis identified episiotomy as an independent factor associated with the outcome of ΔHb ≥1.5 g/dL, whereas BMI exhibited a marginal tendency yet failed to attain statistical significance.

Interpretation

The role of PLT and platelet indices in predicting PPH and its related complications has not yet been clearly established due to inconsistent findings in the literature. In a study including women undergoing low-risk vaginal delivery, lower antepartum MPV values were reported to be useful for predicting PPH (10). On the contrary, another cohort with a similar risk profile identified increased intrapartum PDW and higher antepartum hematocrit levels as prognostic markers for stratifying PPH severity, while no significant association was observed between antepartum MPV or PDW values and PPH (4). In a large cohort comprising both cesarean and vaginal deliveries, lower PLT and PCT levels together with higher PDW values were reported to be independently associated with an increased risk of severe PPH, whereas no significant association was found for MPV; subgroup analyses further demonstrated that these relationships varied according to the mode of delivery (12). These inconsistent results in the literature have been ascribed to variations in the clinical risk characteristics of the studied cohorts, mode of delivery, methods used to quantify blood loss, and the timing of biomarker sampling (2,3). Focusing specifically on low-risk spontaneous vaginal deliveries, our findings align with contemporary literature suggesting that platelet indices have limited value as independent predictors of PPH, indicating that the prognostic utility of these parameters may vary significantly depending on the clinical context. However, given the relatively modest sample size of the present cohort, these negative findings should not be interpreted as definitive evidence of no association. Rather, they indicate that no detectable relationship between platelet indices and postpartum Hb decline was observed in the available sample, although the study may have been underpowered to detect small effect sizes.

The negative findings observed in our study regarding platelet indices may be attributable to the limited influence of platelet biology on core pathophysiological mechanisms underlying PPH. MPV and PDW, which serve as indirect markers of platelet production kinetics and activation status, are well-established hematologic indices with recognized prognostic relevance in thrombo-inflammatory processes (7,8). Elevated MPV values reflect the presence of younger circulating platelets with higher granule content and greater prothrombotic potential and have therefore been associated with more effective hemostatic activity (14). By contrast, PPH occurring during low-risk vaginal deliveries is predominantly driven by non-systemic factors, such as localized uterine dysfunction (uterine atony) and soft tissue trauma of the lower genital tract. This pathophysiological dissociation between systemic platelet activation and locally driven, trauma-related bleeding mechanisms provides a plausible framework to explain the limited ability of volumetric platelet indices to predict postpartum Hb decline.

The absence of a significant association between PLT and postpartum Hb decline observed in our study may be interpreted as consistent with pregnancy-specific physiological adaptations and the threshold-based hemostatic model described in the literature. Physiological thrombocytopenia, particularly evident during the second half of pregnancy, is generally regarded as a benign condition in most cases and does not, in isolation, confer a meaningful increase in PPH risk (15,16). Nevertheless, substantial evidence indicates that as thrombocytopenia deepens—especially at severe levels—the risk of PPH and the need for transfusion increase markedly (12,17). These studies demonstrate that the relationship between PLT and bleeding risk is not linear; rather, the clinical significance becomes apparent once PLT falls below a critical threshold. Other investigations have emphasized that postpartum hemostatic competence cannot be adequately explained by a quantitative assessment based solely on PLT; instead, a more comprehensive approach incorporating fibrinogen levels and additional components of the coagulation cascade that functionally interact with platelets, such as Factor XIII, is required (18,19). Within this context, the predominance of PLT values above critical thresholds in our low-risk vaginal delivery cohort provides a plausible explanation for the absence of a statistically significant relationship between PLT and postpartum Hb decline. Notably, a recent cesarean-delivery cohort reported that lower preoperative PLT and PCT values were associated with a ≥2 g/dL postoperative Hb decline, highlighting potential delivery-mode-dependent heterogeneity and suggesting that the predictive relevance of platelet-related parameters may differ between cesarean and vaginal deliveries (20).

From a clinical perspective, episiotomy was the only variable independently associated with a pronounced postpartum Hb decline (≥1.5 g/dL) in the multivariable analysis. This finding should be interpreted as an independent association rather than evidence of a causal relationship, given the retrospective design of the study. In this low-risk vaginal delivery cohort, in which the predictive capacity of platelet-based biomarkers was limited, the observed association may reflect the contribution of local obstetric trauma to postpartum Hb decline. However, unmeasured clinical factors related to the indication, performance, or extent of episiotomy cannot be excluded. The statistical demonstration of this association may have been facilitated by the use of ΔHb as an objective laboratory-based surrogate marker of postpartum blood loss, rather than relying solely on subjective visual estimation methods characterized by high error rates (2,3). Collectively, these findings suggest that, in low-risk vaginal deliveries, obstetric factors related to perineal trauma may warrant careful consideration alongside biomarkers when evaluating the risk of postpartum blood loss.

A distinct strength of this study is its focus on a low-risk and homogeneous cohort of vaginal deliveries, which allows a clearer evaluation of the impact of platelet parameters on PPH within a clinical context in which potential confounding factors are largely minimized. Another important strength is the assessment of PPH severity using ΔHb as an objective and quantitative indicator, rather than relying on subjective visual estimations. This approach reduced measurement error and thereby enhanced the internal validity of the study findings.

Study Limitations

Several limitations of the present study should be acknowledged. First, the retrospective and single-center design inherently limits causal inference and may restrict the generalizability of the findings to broader populations. Second, postpartum Hb decline was used as a surrogate marker of postpartum blood loss rather than as a direct volumetric measurement of PPH. The use of a single Hb measurement obtained at 6 hours postpartum also warrants careful interpretation. Although this early time point is practical for assessing acute postpartum changes, it may not fully capture the extent of blood loss or the subsequent severity of anemia. At this early postpartum stage, physiological fluid shifts, including hemodilution and hemoconcentration, may not yet have stabilized, potentially leading to underestimation or misclassification of ongoing or delayed blood loss. In addition, the analysis was confined to routine CBC parameters; the inability to evaluate advanced hemostatic markers, such as fibrinogen levels or Factor XIII activity, precluded a more comprehensive characterization of the biological underpinnings of PPH. Finally, the relatively modest sample size may have reduced the statistical power to detect small but potentially relevant associations between platelet indices and postpartum Hb decline. This limitation is particularly important when interpreting the negative findings for platelet indices because weak associations or limited discriminatory signals may not have been captured in the available cohort. Therefore, the absence of statistically significant associations should be interpreted cautiously and not be considered definitive evidence against a potential minor contribution from platelet-related parameters. Accordingly, future large-scale, prospective, multicenter studies incorporating a broader range of hemostatic parameters are warranted to enable a more precise and comprehensive assessment of PPH risk.

Conclusion

This study demonstrates that, in low-risk vaginal deliveries, the clinical utility of PLT and platelet indices for predicting postpartum Hb decline is limited. Although episiotomy emerged as an independent factor associated with greater postpartum Hb decline, the retrospective nature of this study precludes the establishment of a definitive causal relationship. Overall, these findings suggest that platelet-related biomarkers alone may be insufficient for assessing postpartum blood loss risk, and that obstetric factors related to perineal trauma should be interpreted alongside biological parameters within the clinical context.

Ethics

Ethics Committee Approval: The research protocol was implemented in accordance with the ethical principles outlined in the Declaration of Helsinki and was approved by the Local Clinical Research Ethics Committee of University of Health Sciences Turkey, Başakşehir Çam and Sakura City Hospital (approval no: KAEK/21.05.2025.180, date: 30.05.2025).

Informed Consent: Due to the retrospective design of the study, informed consent was not obtained from the patients. The study was conducted using data retrieved from the hospital database.

Footnotes

Authorship Contributions

Surgical and Medical Practices: E.D., Concept: Y.K., E.D., Design: Y.K., E.D., Data Collection or Processing: Y.K., E.D., Analysis or Interpretation: Y.K. Literature Search: Y.K., Writing: Y.K., E.D.

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