Original Article

Aetiology-Specific Impact of Thrombocytopenia on Maternal and Neonatal Outcomes in Pregnancy: A Prospective Cohort Study from a Resource-Limited Setting

Chandnee Rehman[1], Nafeesa Ghani[2], Nazia Noushin[3], Sanam Gul[4], Amna Saeed[5], Numan Ghani[6]

[1]Specialist Registrar Obs & Gyne Hayatabad Medical Complex Peshawar
[2]Junior Registrar Obs & Gyne Mercy Teaching Hospital PMC Peshawar
[3]Women Medical Officer at RHC District Karak, [4]Senior Medical Officer, Alkhidmat Hospital Swabi
[5]Postgraduate Resident, Hayatabad Medical Complex Peshawar, [6]TMO Lady Reading Hospital Peshawar

Correspondence: *Dr Nafeesa Ghani*
Junior Registrar Obs Gyne Mercy Teaching Hospital PMC Peshawar
nafeesaghani81@gmail.com

Abstract

Objective: This study aimed to evaluate the impact of thrombocytopenia on maternal and neonatal outcomes stratified by etiology (gestational thrombocytopenia, immune thrombocytopenic purpura [ITP], hypertensive disorders, and secondary causes) and identify predictors of adverse events.

Methodology: This was a prospective observational study conducted in the Department of Gynecology and Obstetrics, Hayatabad Medical Complex (HMC), Peshawar, from January 2021 to December 2022. Pregnant women with thrombocytopenia (platelet count <150,000/µL) who received antenatal and delivery care at our institution were consecutively enrolled after informed consent. Participants were stratified according to the etiology of thrombocytopenia and followed through delivery to assess maternal and neonatal outcomes. Inclusion criteria included singleton pregnancies of ≥20 weeks gestation with documented thrombocytopenia.

Results: A total of 250 pregnant women diagnosed with thrombocytopenia were included. The mean maternal age was 28.4 ± 5.2 years, and the majority (62%) were multiparous. Thrombocytopenia was diagnosed at a mean gestational age of 28.6 ± 6.4 weeks. The mean gestational age at delivery was 37.1 ± 2.7 weeks. The average platelet count at diagnosis was 96,200/µL (range: 28,000–149,000/µL). Based on etiology, 58% of cases were classified as gestational thrombocytopenia, 34% were associated with hypertensive disorders of pregnancy (including preeclampsia and HELLP syndrome), 6% were due to immune thrombocytopenic purpura (ITP), and 2% were attributed to other secondary causes (e.g., infections, drug-induced). Comorbidities were present in 38% of patients, with hypertensive disorders being the most common (34%), followed by gestational diabetes (6%) and hypothyroidism (2%).

Conclusion: Thrombocytopenia in pregnancy impacts maternal and neonatal outcomes in an etiology-dependent manner. Hypertensive-related thrombocytopenia was associated with higher maternal morbidity, while ITP posed greater neonatal risks. In contrast, gestational thrombocytopenia had a benign course with favorable outcomes. Early identification and etiology-specific management are essential to improve maternal and neonatal outcomes.

Keywords: Thrombocytopenia, Pregnancy outcomes, Hypertensive disorders, Neonatal thrombocytopenia.

Cite this article as: Rehman C, Ghani N, Noushin N, Gul S, Saeed A, Ghani N. Aetiology-Specific Impact of Thrombocytopenia on Maternal and Neonatal Outcomes in Pregnancy: A Prospective Cohort Study from a Resource-Limited Setting. J Soc Obstet Gynaecol Pak. 2025; 15(4):234-239. DOI. 10.71104/jsogp.v15i4.960

Introduction

Thrombocytopenia, defined as a platelet count of less than 150,000/µL, is one of the most prevalent hematological abnormalities seen during pregnancy, with an incidence of about 7–10% of all pregnancies.[1] It can have multiple causes, from benign gestational thrombocytopenia to more severe ones such as preeclampsia, HELLP syndrome (Hemolysis, Elevated Liver enzymes, Low Platelets), immune thrombocytopenic purpura (ITP), or thrombotic microangiopathies.[2,3] Although commonly observed, the utility of thrombocytopenia in pregnancy, with respect to maternal and fetal outcomes, is not well defined in the literature.

Gestational thrombocytopenia, which comprises

Authorship Contribution: [1,2,3]Substantial contributions to the conception or design of the work or the acquisition, Final approval of the study to be published, [4,5,6]Drafting the work or revising it critically for important intellectual content.

Funding Source: none
Conflict of Interest: none

Received: May 14, 2025 Revised: Sept 11, 2025
Accepted: Oct 26, 2025

almost 75% of cases, is usually mild and asymptomatic with platelet counts rarely less than 70,000/µL and no significant maternal or neonatal morbidity.[4] Immune-mediated and hypertensive disorders-associated thrombocytopenia are associated with severe outcomes including placental abruption, intrauterine growth restriction (IUGR), preterm birth and increased peripartum hemorrhage[5,6]; however, the clinical significance is controversial. In addition, severe thrombocytopenia poses challenges for anesthesia, including the safety of neuraxial blocks, and increases the risk of bleeding during delivery and postpartum.[7,8]

Neonatal outcomes are also increasingly a concern, particularly with maternal ITP, where transfer of antiplatelet antibodies across the placenta may lead to neonatal thrombocytopenia and increase risk of intracranial hemorrhage.[9,10] Current management approaches for thrombocytopenia in pregnancy depend primarily on the cause, gestational age, and degree of platelet drop, with corticosteroids, IVIG and early delivery often selected for severe or unresponsive cases .[11]

Although there are several studies regarding thrombocytopenia in pregnancy, they are mainly focused on single subtypes or single complications. Knowledge gap exists due to the lack of comprehensive data assessing the burden of thrombocytopenia irrespective of its varied aetiologies on maternal and neonatal outcome, particularly in resource limited settings.12 Finally, there is inconsistent data on what platelet level is safe for labor and delivery, particularly regarding anesthesia and bleeding risk. Therefore, a clear gap in research exists regarding the synthesis of the remarkably diverse pregnancy outcomes in the setting of thrombocytopenia, categorized by cause and severity, in order to guide evidence-based management protocols. This gap needs to be addressed to help improve antenatal surveillance, risk stratification, and delivery planning among affected pregnancies.

Methodology

This was a prospective observational study conducted in the Department of Gynecology and Obstetrics, Hayatabad Medical Complex (HMC), Peshawar, from January 2021 to December 2022. Pregnant women with thrombocytopenia (platelet count <150,000/µL) who received antenatal and delivery care at our institution were consecutively enrolled after informed consent. Participants were stratified according to the etiology of thrombocytopenia and followed through delivery to assess maternal and neonatal outcomes. Inclusion criteria included singleton pregnancies of ≥20 weeks gestation with documented thrombocytopenia.

All pregnant women presenting to outpatient department (OPD) of gyne & obs, during the study period were screened for eligibility. Patients were included in the study if they met the following criteria: confirmed pregnancy, thrombocytopenia (platelet count <150,000/µL) at any time point of gestational age, and willingness to participate in the study. Women with established hematological disorders before pregnancy, those with missing medical records, and patients who had lost to follow-up during study period were excluded. The mean gestational age at diagnosis was 28.6 ± 6.4 weeks, and 62% of participants were multiparous.

Cases were categorized according to the underlying etiology of thrombocytopenia gestational thrombocytopenia, immune thrombocytopenic purpura (ITP), hypertensive disorders (preeclampsia/HELLP syndrome), and other secondary causes—based on clinical and laboratory findings.

- Gestational thrombocytopenia was defined as asymptomatic, mild thrombocytopenia (typically >70,000/µL) diagnosed in the third trimester, without prior history or secondary cause.
- ITP was diagnosed based on persistent thrombocytopenia (<100,000/µL) with immune-mediated etiology or by exclusion of secondary causes.
- Hypertensive-related thrombocytopenia included cases meeting ACOG criteria for preeclampsia or HELLP syndrome.
- Other secondary causes included drug-induced thrombocytopenia, infections, or systemic diseases confirmed via clinical evaluation and laboratory testing.

  This etiologic stratification enabled subgroup analysis based on disease pathophysiology and clinical outcomes.

Sample size was calculated based on the prevalence of thrombocytopenia in pregnancy reported 8.8 percent,[7] to find statistically significant relationships with a 95-percent confidence level, a margin of error of 5 percent to consider a 10-percent attrition rate was 250 participants. The data were collected through

structured interview with the help of exhaustive review of medical records, medical history, and clinical examination. The variables which were measured were maternal age, parity, gestational age at the time of diagnosis, and comorbid medical conditions and especially hypertensive disorders.

Maternal outcomes of interest were the occurrence of antepartum or postpartum hemorrhage, blood transfusion requirements, mode of delivery (spontaneous vaginal, assisted vaginal, or cesarean delivery), and anesthesia-related complications with specific focus on neuraxial techniques. The fetal and neonatal outcomes evaluated included gestational age at delivery, birth weight, presence of Fetal growth restriction, neonatal platelet counts, and the incidence of severe complications, including intracranial hemorrhage.

For statistical analysis, SPSS version 26.0 was used. Continuous variables were reported as mean with standard deviation for normally distributed data or median with interquartile range for non-normally distributed variables after evaluating normal distribution using the Shapiro-Wilk test. Categorical variables were expressed as frequencies and percentages. Comparative analyses used appropriate statistical tests: for continuous variables, the Student's t test was used, and for categorical variables, the chi-square test was applied. A multivariate logistic regression analysis for independent risk factors was performed for adverse outcomes with adjusting factors such as maternal age, gestational age, and comorbidities. Participants with overlapping etiologies were classified based on the most clinically dominant diagnosis to ensure mutually exclusive subgroup analysis

Study protocol was approved by the ethical review board of Hayatabad Medical Complex (ref# 1644). All participants provided written informed consent before their inclusion in the study. Data collection and analysis were performed under institutional guidelines on clinical research and with respect to patient confidentiality.

Results

The mean maternal age of the study participants was 28.4 ± 5.2 years, with 62% of participants being multiparous. Thrombocytopenia was diagnosed at a mean gestational age of 28.6 ± 6.4 weeks. Hypertensive disorders (preeclampsia/HELLP syndrome) were the most common comorbidity (34%), followed by gestational thrombocytopenia (58%), immune thrombocytopenic purpura (ITP) (6%), and other secondary causes (2%). Table I summarizes the baseline characteristics

Following baseline assessment, serial platelet monitoring revealed significant differences across etiologies. Women with hypertensive disorders experienced a significant decline in platelet counts from diagnosis (median 85,000/μL) to delivery (68,000/μL, p<0.001). In contrast, platelet levels in gestational thrombocytopenia remained relatively stable (112,000/μL at diagnosis vs. 105,000/μL at delivery, p=0.12). Severe thrombocytopenia (<50,000/μL) was observed in 87% of ITP cases and 29% of those with hypertensive disorders. None of the respondents had overlapping etiologies; all the respondents were assigned a primary diagnosis depending on the accepted criteria (Figure 1).

Maternal complications are shown in Table II. Postpartum hemorrhage (PPH) occurred in 18% of cases, with the highest incidence in hypertensive disorders (32%) and ITP (27%) (p<0.01). Blood transfusions were required in 14% of participants, predominantly among women with platelet counts <50,000/μL (OR = 4.2; 95% CI: 2.1–8.3). Cesarean delivery was significantly more common in hypertensive disorders (58%) compared to gestational thrombocytopenia (22%) (p<0.001). Neuraxial anesthesia was avoided in 76% of women with platelet counts <80,000/μL due to bleeding risk.

In terms of neonatal outcomes (Table III), preterm birth (<37 weeks) occurred in 26% of cases, with the highest rate among women with hypertensive disorders (44%, p<0.001). Neonatal thrombocytopenia (platelet count

Table I: Baseline Demographic and Clinical Characteristics.

Variable	Gestational thrombocytopenia	ITP	Hypertensive Disorders	Other Causes	Total	P value
Maternal Age (years)	27.8 ± 4.9	29.1 ± 5.7	29.5 ± 5.4	30.2 ± 6.1	28.4 ± 5.2	0.796
Primiparity	61 (42%)	5 (33%)	25 (29%)	2 (40%)	93 (38%)	0.463
Multiparity	84 (58%)	10 (67%)	60 (71%)	3 (60%)	157 (62%)	0.463
Gestational age at diagnosis (weeks)	30.1 ± 5.8	26.4 ± 7.2	26.8 ± 6.9	24.0 ± 7.5	28.6 ± 6.4	0.002
Platelet count at diagnosis	112 ± 28	48 ± 15	85 ± 24	62 ± 18	98 ± 32	<0.0001

<150,000/μL) was reported in 12% of newborns, predominantly in ITP cases (53%, p=0.001). Low birth weight (<2500g) and Fetal growth restriction (FGR) were significantly associated with hypertensive disorders (39% and 28%, respectively).

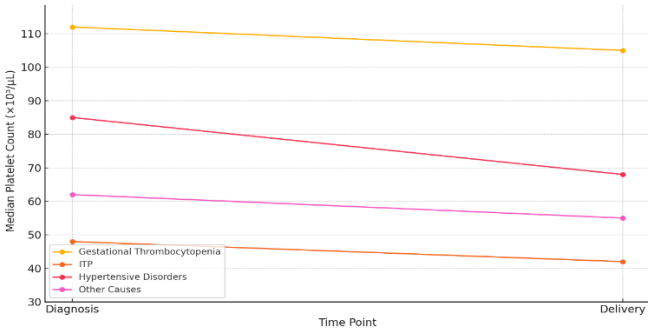

Figure 1. Platelet count trends by etiology.

Multivariate logistic regression analysis was conducted to identify independent predictors of maternal and neonatal complications (Table 4). A platelet count <50,000/μL (adjusted OR = 3.8; 95% CI: 1.9–7.6) and presence of hypertensive disorders (adjusted OR = 4.1; 95% CI: 2.2–7.7) were significantly associated with adverse maternal outcomes. For neonatal complications, hypertensive disorders independently predicted preterm birth (adjusted OR = 5.2; 95% CI: 2.8–9.6), while maternal ITP was a strong predictor of neonatal thrombocytopenia (adjusted OR = 9.4; 95% CI: 3.1–28.3).

Discussion

The result of this study not only supports but also contradicts the prior literature, providing the most important new details on the effects of thrombocytopenia on the outcomes of childbirth. The following systematic comparison highlights important similarities and differences between our findings with the body of previous evidence.

This study provides new insight into how thrombocytopenia impacts pregnancy outcomes, thereby corroborating and contrasting with prior work. In the next few sections we systematically compare and contrast our findings with the existing body of evidence, and highlight key similarities and differences.

The results of our study show that gestational thrombocytopenia is the most common cause (58%), which is similar to the findings of Gonzalez et al[13], with which he found to be the most frequent cause (75%). The lower prevalence in our cohort, however, may be due to local differences in diagnostic procedures or stricter exclusion criteria from chronic illness. The 34% of hypertensive disorders in the present analysis may be explained by our inclusion of HELLP syndrome cases, which are associated with severe thrombocytopenia, which contrast with the 25–30% prevalence.[13]

The 32% higher rate of PPH found in hypertensive disorder in our study compares favorably with the results of the Gullet et al[14] findings that are associated with preeclampsia due to endothelial dysfunction and platelet consumption. However, our reported rates of PPH are higher than the threshold (20%) of the Huang

Table II: Maternal Complications by aetiology.

Outcome	Gestational thrombocytopenia	ITP	Hypertensive disorders	Other causes	Total	p-value
Postpartum Hemorrhage	13 (9%)	4 (27%)	27 (32%)	1 (20%)	45 (18%)	<0.01
Blood Transfusion	7 (5%)	5 (33%)	20 (24%)	1 (20%)	35 (14%)	<0.001
Cesarean Delivery	32 (22%)	6 (40%)	49 (58%)	2 (40%)	95 (38%)	<0.001
Anesthesia Complications	4 (3%)	2 (13%)	13 (15%)	1 (20%)	20 (8%)	0.02

Table III: Neonatal Outcomes by Maternal Etiology.

Outcome	Gestational thrombocytopenia	ITP	Hypertensive disorders	Other causes	Total	p-value
Preterm Birth	26 (18%)	4 (27%)	37 (44%)	1 (20%)	65 (26%)	<0.001
Neonatal Thrombocytopenia	6 (4%)	8 (53%)	13 (15%)	1 (20%)	30 (12%)	0.001
Low Birth Weight	22 (15%)	3 (20%)	33 (39%)	1 (20%)	59 (24%)	<0.001
Fetal Growth Restriction (FGR)	15 (10%)	2 (13%)	24 (28%)	1 (20%)	45 (18%)	0.003

Table IV: Multivariate Analysis of Factors Associated with Adverse Outcomes.

Variable	Associated Outcome	Adjusted Odds Ratio (aOR)	95% Confidence Interval	p-value
Platelet count <50,000/μL	Adverse maternal outcomes	3.8	1.9–7.6	<0.001
Hypertensive disorders	Adverse maternal outcomes & Preterm birth	4.1	2.2–7.7	<0.001
Maternal ITP	Neonatal thrombocytopenia	9.4	3.1–28.3	<0.001

et al findings.[15] however, this threshold may be exceeded due to our inclusion of women with advanced HELLP. The transfusion rate of 33% for ITP in our study correlates with the findings of Huang et al[15] who detailed the bleeding risk in immune-mediated thrombocytopenia. In contrast, our rate of transfusion for gestational thrombocytopenia at 5% is in line with findings from Boomshma et al.[16]

This study's high cesarean rate (58%) for hypertensive disorder patients is in line with the reported caesarean rate of Xu et al[17] findings and reflects institutional policies for an accelerated delivery in preeclampsia. This is contrary to the observation made by Van D et al.[18], where they found that a stable number of platelets, as was observed in our cohort (22%), went hand in hand with a lower occurrence of gestational thrombocytopenia.

The incidence of neonatal thrombocytopenia in ITP was 53% in our study, which is higher than those reported by Chawanpaiboon et al (25–30%).[19] this might be due to inter-laboratory differences in antiplatelet antibody testing or could be the result of the small size of our ITP subgroup (n=15). The rate of spontaneous preterm birth in hypertensive disorders found in this study (44%) is in agreement with the results of Chawanpaiboon et al[19] from resource-limited backgrounds, however, it is higher than the 35% reported by Wang J et al.[20] These variations may result from the sudden cessation of severe preeclampsia caused by iatrogenic delivery.

Our study found that only 4% of neonates exhibited thrombocytopenia due to gestational etiology, reinforcing the generally favorable prenatal prognosis established by Raikkonen et al.[21] However, we report a prevalence of 28% FGR in hypertensive diseases, which is markedly higher than the 18% rate of Raikonnen et al findings.[21] This could be due to a delay in recognizing placental insufficiency in our context.

Platelet counts <50,000/µL were identified the most significant predictor of adverse outcomes (aOR=3.8) in our study and comparable to prior study by Zhu et al [22], that targeted thresholds for avoidance of neuraxial anesthesia. While mirroring global patterns, the high association between hypertensive disorder and preterm birth (aOR=5.2) points to the fact that risks are heightened in low-resource settings through limited availability of antenatal monitoring.

The study's primary strengths include its prospective design, assessment of etiology-specific effects, and significance of the results for low-resource settings where thrombocytopenia management is still relevant. However, the single-center cohort, small subgroup sizes (like ITP), and lack of long-term neonatal follow-up may restrict generalizability. Furthermore, the employment of institutional diagnostic policies and the lack of pre-existing hematologic diseases may result in an additional selection bias. Future research should involve lengthier follow-up to assess long-term neonatal outcomes, standardized antibody testing for immune-mediated illnesses, and multi-centering to aid in sample variety. Risk-stratified anesthetic and birth planning guidelines could assist protect mothers and fetuses in low-resource environments.

Conclusion

Thrombocytopenia in pregnancy is associated with different maternal and neonatal risks dependent on the aetiology, where hypertensive disorders (preeclampsia/HELLP) are associated with both a high maternal complication risk. Despite the benign nature of gestational thrombocytopenia and low platelet counts were predictive of adverse events and highlight the need for individualized and resource focused monitoring and intervention. These findings support per-institutional standards, etiology-specific therapy, IVIG for ITP, and early delivery in cases of hypertension. For validation and long-term follow-up of the neonates in other facilities, this should then be followed up with additional research in the future.

References

1. Beltrami-Moreira M, Sharma A, Bussel JB. Immune thrombocytopenia and pregnancy: challenges and opportunities in diagnosis and management. *Expert Rev Hematol.* 2024;17(9):595–607. https://doi.org/10.1080/17474086.2024.2385481
2. Mangla A, Hamad H. Thrombocytopenia in pregnancy. In: *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan–. Available from: https://www.ncbi.nlm.nih.gov/books/NBK547705/
3. Clark R, Lindsey D, Whiteway S, et al. Dysfunctional immune system reconstitution after rituximab exposure in utero. *J Pediatr Hematol Oncol.* 2021;43(4):E601–E604. https://doi.org/10.1097/MPH.0000000000001871
4. Scully M, Cataland SR, Peyvandi F, et al.; HERCULES Investigators. Caplacizumab treatment for acquired thrombotic thrombocytopenic purpura. *N Engl J Med.* 2019;380(4):335–346. https://doi.org/10.1056/NEJMoa1806311
5. Arcudi S, Ronchi A, Capecchi M, et al. Assessment of post-partum haemorrhage risk among women with moderate thrombocytopenia. *Br J Haematol.* 2022;197(4):482–488. https://doi.org/10.1111/bjh.18098
6. Fogerty AE, Dzik W. Gestational thrombocytopenia: a case-control study of over 3,500 pregnancies. *Br J Haematol.* 2021;194(2):433–438. https://doi.org/10.1111/bjh.17611
7. Wijnsma KL, Ter Heine R, Moes DJAR, et al. Pharmacology, pharmacokinetics and pharmacodynamics of eculizumab, and

possibilities for an individualized approach. *Clin Pharmacokinet.* 2019;58(7):859–874. https://doi.org/10.1007/s40262-019-00748-3
8. Khanuja K, Levy AT, Ra M, et al. Pre- and postpregnancy platelet counts: evaluating accuracy of gestational thrombocytopenia and immune thrombocytopenia purpura diagnoses. *Am J Obstet Gynecol MFM.*2022;4(3):100606. https://doi.org/10.1016/j.ajogmf.2022.100606
9. Stefanovic V. The extended use of eculizumab in pregnancy and complement activation–associated diseases affecting maternal, fetal and neonatal kidneys. *J Clin Med.* 2019;8(3):410. https://doi.org/10.3390/jcm8030410
10. Al-Samkari H, Rosovsky RP, Karp Leaf RS, et al. A modern reassessment of glycoprotein-specific direct platelet autoantibody testing in immune thrombocytopenia. *Blood Adv.* 2020;4(1):9–18. https://doi.org/10.1182/bloodadvances.2019000868
11. Sarno L, Tufano A, Maruotti GM, Martinelli P, Balletta MM, Russo D. Eculizumab in pregnancy: a narrative overview. *J Nephrol.* 2019;32(1):17–25. https://doi.org/10.1007/s40620-018-00552-9
12. van Dijk WEM, Nijdam JS, Haitjema S, et al. Platelet count and indices as postpartum hemorrhage risk factors: a retrospective cohort study. *J Thromb Haemost.* 2021;19(11):2873–2883. https://doi.org/10.1111/jth.15481
13. Gonzalez-Porras JR, Palomino D, Vaquero-Roncero LM, et al. Bleeding complications associated with pregnancy with primary immune thrombocytopenia: a meta-analysis. *Open Companion J Thromb Haemost.* 2022;6(3):e230. https://doi.org/10.1055/a-1837-7581
14. Guillet S, Loustau V, Boutin E, et al. Immune thrombocytopenia and pregnancy: an exposed/nonexposed cohort study. *Blood.* 2023;141(1):11–21. https://doi.org/10.1182/blood.2022017277
15. Huang QS, Zhu XL, Qu QY, et al. Prediction of postpartum hemorrhage in pregnant women with immune thrombocytopenia: development and validation of the MONITOR model. *Am J Hematol.* 2021;96(5):561–570. https://doi.org/10.1002/ajh.26134
16. Boomsma CM, Kamath MS, Keay SD, et al. Peri-implantation glucocorticoid administration for assisted reproductive technology cycles. *Cochrane Database Syst Rev.* 2022;6(6):CD005996. https://doi.org/10.1002/14651858.CD005996.pub4
17. Xu X, Liang MY, Wang YL, et al. Lower-dose corticosteroid therapy in severe immune thrombocytopenia during pregnancy: comparable efficacy and lower maternal complications. *Front Pharmacol.* 2022;13:983734. https://doi.org/10.3389/fphar.2022.983734
18. Van der Heijden JEM, Van Hove H, Van Elst NM, et al. Optimization of betamethasone and dexamethasone dosing regimens during pregnancy: a combined placenta perfusion and PBPK modeling approach. *Am J Obstet Gynecol.* 2024. https://doi.org/10.1016/j.ajog.2024.05.012
19. Chawanpaiboon S, Chukaew R, Pooliam J. A comparison of two doses of antenatal dexamethasone for prevention of respiratory distress syndrome: an open-label, noninferiority, pragmatic randomized trial. *Am J Obstet Gynecol.* 2024;230(2):e2601–e26019. https://doi.org/10.1016/j.ajog.2023.07.006
20. Wang J, Chen F, Zhu S, et al. Adverse effects of prenatal dexamethasone exposure on fetal development. *J Reprod Immunol.* 2022;151:103619. https://doi.org/10.1016/j.jri.2022.103619
21. Räikkönen K, Gissler M, Kajantie E. Associations between maternal antenatal corticosteroid treatment and mental and behavioral disorders in children. *JAMA.* 2020;323(19):1924. https://doi.org/10.1001/jama.2020.3937
22. Zhu XL, Feng R, Huang QS, et al. Prednisone plus IVIg compared with prednisone or IVIg for immune thrombocytopenia in pregnancy: a national retrospective cohort study. *Ther Adv Hematol.* 2022;13:20406207221095226. https://doi.org/10.1177/20406207221095226