Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/z39ydz44

PREDICTORS AND OUTCOMES OF BLOOD TRANSFUSION IN OBSTETRICS AND GYNECOLOGY AT A TERTIARY CARE CENTRE

Ahaan Sharieff[1*], Subhranil Das[2], Suhaan Sharieff[3], Dr. Sandra Marie Joe[4], Dr. Deepa Karmali[5], Dr. Jatin Prajapati[6*]

[1,2] MBBS student, Kalinga Institute of Medical Sciences, Bhubneshwar, Odisha, India.
[3] MBBS student, Krishna Institute of Medical Sciences, Karad, Maharashtra, India.
[4] Senior Resident, Department of Obstetrics and Gynaecology, Goa Medical College, Bambolin, Goa, India.
[5] Associate Professor, Department of Obstetrics and Gynaecology, Goa Medical College, Bambolin, Goa, India. (ORCID: https://orcid.org/0000-0002-8324-9359)
[6*]Senior Resident, Department of Community Medicine, World College of Medical Sciences and Research, Jhajjar, Haryana, India

***Corresponding Author:** Dr Jatin Prajapati
* Department of Community Medicine, World College of Medical Sciences and Research, Jhajjar, Haryana, India. PIN Code- 124103 E-mail ID: iamjatinprajapati@gmail.com ORCID: https://orcid.org/0009-0004-7298-4499

ABSTRACT

Background: Blood transfusion is a critical component of care in obstetrics and gynecology, particularly in the management of obstetric hemorrhage, severe anemia, and gynecological bleeding disorders. However, transfusion practices vary widely due to differences in patient characteristics, clinical presentation, and underlying pathology. Understanding predictors and outcomes of transfusion in real-world settings is essential for optimizing patient blood management and transfusion stewardship.

Objectives: To evaluate predictors, indications, and immediate outcomes of blood transfusion among obstetric and gynecological patients at a tertiary care centre, and to compare transfusion practices between the two groups.

Methods: A prospective observational study was conducted in the Department of Obstetrics and Gynecology at a tertiary care centre over seven months (March–September 2025). All obstetric and gynecological patients receiving at least one blood transfusion during hospital admission were included using universal sampling. Sociodemographic variables, clinical parameters, anemia severity, indications for transfusion, blood component usage, transfusion burden, and transfusion reactions were recorded. Data were analyzed using SPSS version 23. Categorical variables were compared using the chi-square or Fisher's exact test, and a p-value <0.05 was considered statistically significant.

Results: A total of 145 patients were included, comprising 76 obstetric (52.4%) and 69 gynecological (47.6%) patients. Gynecological patients were significantly older than obstetric patients ($p<0.001$) and were more likely to present with severe or very severe anemia (65.2% vs 27.6%; $p<0.001$). Prior

intake of hematinics was significantly higher among obstetric patients (52.6% vs 7.2%; p<0.001). Obstetric transfusions were predominantly for asymptomatic anemia and hemorrhagic obstetric conditions, whereas gynecological transfusions were mainly due to abnormal uterine bleeding, fibroids, and malignancies (p<0.001). ABO blood group distribution, transfusion burden (number of PRBC units), and transfusion reaction rates did not differ significantly between the two groups. Transfusion reactions were rare, occurring in only one patient.
Conclusion: Predictors of blood transfusion differ markedly between obstetric and gynecological patients, with anemia severity, age, and underlying pathology playing key roles. Despite differing indications, transfusion burden and safety outcomes were comparable. Strengthening patient blood management strategies, particularly early anemia correction in gynecological patients and protocol-based hemorrhage management in obstetrics, may further optimize transfusion practices and resource utilization.

Keywords: Blood transfusion; Obstetrics; Gynecology; Anemia; Patient blood management; Postpartum hemorrhage; Transfusion outcomes

INTRODUCTION

Blood transfusion remains a cornerstone of life-saving care in obstetrics and gynecology, where clinicians must often balance urgent hemodynamic stabilization against the risks and costs associated with allogeneic blood products. Obstetric hemorrhage—particularly postpartum hemorrhage (PPH)—continues to be a leading cause of severe maternal morbidity and preventable maternal mortality worldwide, and timely access to red blood cells and blood components is central to its management [1–3]. At the same time, transfusion is also common in gynecological practice, especially in patients with abnormal uterine bleeding, fibroid-related menorrhagia, perioperative blood loss, and gynecologic malignancies requiring major surgery [4,5]. Across these clinical scenarios, transfusion decisions frequently occur under time pressure and with incomplete information, which can contribute to variability in practice and potential over- or under-transfusion.

The World Health Organization (WHO) emphasizes that blood is a limited and valuable resource, and that health systems should promote the safe and rational use of blood products through structured approaches such as patient blood management (PBM) and evidence-based clinical use of blood [6,7]. PBM is a multi-modal, patient-centered strategy aimed at optimizing hemoglobin and iron stores, minimizing blood loss, improving hemostasis, and employing restrictive transfusion strategies when appropriate [6–8]. In women's health, PBM is particularly relevant because many patients enter pregnancy or surgery with underlying anemia or iron deficiency, and because obstetric bleeding can evolve rapidly from compensated to catastrophic states requiring massive transfusion protocols [1–3,8].

Transfusion thresholds and triggers have been widely debated. Contemporary guidance in general adult populations increasingly supports restrictive red blood cell transfusion strategies—often considering transfusion at hemoglobin levels around 7 g/dL for stable hospitalized adults—while emphasizing clinical context and symptoms [9,10]. However, obstetric and gynecologic patients may not align neatly with "stable medical" populations because physiological adaptation to pregnancy, acute hemorrhage, and surgical blood loss can change the relationship between hemoglobin levels and tissue oxygen delivery. Moreover, in acute obstetric hemorrhage, transfusion decisions are not based solely on hemoglobin values (which may lag behind the clinical picture) but also on ongoing blood loss, hemodynamic status, and laboratory markers of coagulopathy [1–3,11]. As a result, practice guidelines for PPH and obstetric transfusion stress coordinated, protocol-driven management and rapid access to appropriate components—including packed red blood cells, plasma, platelets, and fibrinogen-containing products—when massive bleeding occurs [1–3,11,12].

Despite advances in guidelines and PBM concepts, real-world transfusion practices remain heterogeneous across institutions, regions, and clinicians. Reasons for variability include differences in patient case-mix, baseline anemia burden, blood bank logistics, availability of component therapy, and the extent to which standardized hemorrhage protocols or PBM pathways are embedded into routine care [6–8,13]. Additionally, transfusion decisions may be influenced by a mix of clinical examination (e.g., shock index, pallor, symptoms), point-of-care testing, conventional laboratory parameters (e.g., hemoglobin/hematocrit, platelet count, coagulation studies), and contextual factors such as distance from referral centers or delays in receiving definitive surgical care [1,6,11]. In gynecology, chronic blood loss from heavy menstrual bleeding may present with profound anemia yet relative hemodynamic stability, creating a different decision framework in which optimization with iron therapy and preoperative correction may reduce transfusion dependence [8,13].

Transfusion is not a benign intervention. Beyond acute risks such as allergic reactions, febrile non-hemolytic reactions, hemolytic reactions, transfusion-associated circulatory overload, transfusion-related acute lung injury, and infectious complications, transfusion may be associated with immunomodulatory effects and increased morbidity in some surgical contexts [9,10]. From a systems perspective, inappropriate transfusion increases costs, strains blood inventories, and can reduce availability for patients in genuine need—an important consideration in settings where blood supply is constrained and demand is high [6,7]. These clinical and health-system realities have fueled an increasing emphasis on transfusion stewardship, adherence to evidence-based thresholds where applicable, and structured PBM programs, including early detection and treatment of anemia and iron deficiency in pregnancy and prior to gynecologic surgery [6–8,13].

In obstetrics, PPH prevention and management guidelines recommend preparedness at the facility level, early recognition of excessive blood loss, prompt escalation, and multidisciplinary coordination with the blood bank [1–3]. ACOG highlights the importance of quantitative assessment of blood loss, systematic response plans, and readiness for rapid provision of blood products, including type-specific or O Rh-negative blood in emergencies [1,2]. The Royal College of Obstetricians and Gynaecologists (RCOG) provides guidance addressing appropriate use of blood products in obstetrics, strategies to maximize hemoglobin before delivery, and measures to minimize blood loss [11]. FIGO recommendations similarly emphasize structured management pathways for postpartum hemorrhage and the role of transfusion support when bleeding is severe or ongoing [12].

In gynecology, transfusion commonly relates to heavy menstrual bleeding etiologies (e.g., fibroids, adenomyosis, polyps), malignancy-related bleeding or surgery, and perioperative losses. Unlike acute obstetric hemorrhage, gynecologic patients may present with chronic anemia that is amenable to correction using hematinics and iron therapy—potentially reducing transfusion requirements—if pathways for early detection and optimization are in place [8,13]. Nonetheless, gynecologic surgery can involve substantial blood loss and coagulopathy in select cases, making component therapy and protocol-driven responses relevant here as well [8,13,14]. The growing emphasis on PBM in pregnancy and women's health supports integrating anemia screening, iron deficiency treatment, and standardized transfusion/coagulation algorithms into routine practice [6–8,13].

Given this landscape, there is a practical need for institution-specific evidence describing (i) which patients are most likely to receive transfusion, (ii) how transfusion decisions are made in real-world settings, and (iii) what short-term outcomes follow transfusion in obstetric and gynecologic populations. Identifying predictors—such as anemia severity, hemodynamic parameters, presenting symptoms, and bleeding etiologies—can guide risk stratification, early optimization, and timely escalation of care. Equally, evaluating outcomes such as transfusion reactions, component utilization patterns, and transfusion burden (units transfused) can inform transfusion stewardship and PBM implementation. In many facilities, the greatest opportunity for improvement may not be "more transfusion" or "less transfusion" universally, but rather better-targeted transfusion: matching

component choice and timing to patient physiology, bleeding dynamics, and laboratory evidence of coagulopathy, while minimizing unnecessary exposure to blood products [6–8,11,14].

Accordingly, the present study is framed to examine predictors and outcomes of blood transfusion in obstetrics and gynecology within our setting, with attention to both clinical assessment and laboratory parameters. By comparing obstetric and gynecologic recipients and characterizing transfusion burden, component usage, and adverse events, this work aims to provide locally actionable evidence to refine protocols, strengthen PBM practices, and support judicious use of blood products while maintaining optimal patient outcomes.

MATERIALS AND METHODS

Study Design and Setting: This was a prospective observational study conducted in the Department of Obstetrics and Gynecology, Goa Medical College, Bambolim, Goa, a tertiary care referral centre catering to both routine and high-risk obstetric and gynecological cases.

Study Period: The study was carried out over a period of seven months (March 2025 to September 2025) following approval from the Institutional Ethics Committee (IEC).

Study Population: The study population comprised obstetric and gynecological patients admitted to the department who received at least one blood transfusion during their hospital stay within the study period.

Inclusion Criteria

1. Obstetric patients receiving blood transfusion during:
   - Antenatal period
   - Intrapartum or peripartum period
   - Postpartum period
2. Gynecological patients who required blood transfusion during hospital admission for medical or surgical indications.

Exclusion Criteria

1. Patients admitted to the department who did not receive any blood transfusion.
2. Patients with incomplete or missing medical records related to transfusion parameters.
3. Patients who received emergency blood transfusions outside the hospital prior to admission.

Sampling Method and Sample Size: A universal sampling method was employed. All eligible patients meeting the inclusion criteria during the study period were enrolled consecutively.

The sample size was calculated as 60 using the formula:

$$n = \frac{(Z_\alpha)^2 \times p \times q}{d^2}$$

Where:

- Z_a = 1.96 (95% confidence level)
- p = 0.084 (anticipated transfusion prevalence of 8.4%)
- q = 1 - p = 0.916
- d = 7% (margin of error)

This yielded a minimum sample size of 60 patients. Based on institutional records indicating an average of five transfusions per week, enrollment of the calculated sample size within the study duration was feasible.

Data Collection: Data were collected prospectively from patients 'medical records using a structured data collection proforma. Sources included:

- Case papers and admission notes
- Laboratory reports
- Operation theatre (OT) notes
- Imaging reports
- Blood bank transfusion records

Each patient was followed throughout their hospital stay to document transfusion practices and immediate outcomes.

Study Variables: Sociodemographic variables recorded included age, religion, place of residence, body mass index, socioeconomic status, and occupation. Clinical variables comprised parity, booking status, type of pregnancy or gynecological condition, pulse rate, blood pressure, and prior intake of hematinics. Laboratory parameters included hemoglobin levels and categorization of anemia into mild, moderate, severe, or very severe. Blood group and Rh typing were also documented.

Indications for transfusion were recorded and categorized as anemia, antepartum hemorrhage, postpartum hemorrhage, abortion, ectopic pregnancy, hypertensive disorders of pregnancy, abnormal uterine bleeding, intraoperative blood loss, gynecological malignancy, correction of anemia prior to surgery, or miscellaneous causes. Details regarding the type of intervention, such as vaginal delivery, cesarean section, dilatation and evacuation, dilatation and curettage, exploratory laparotomy, or hysterectomy, were noted where applicable.

Transfusion-related variables included the type of blood product administered, such as whole blood, packed red blood cells, platelet-rich plasma, fresh frozen plasma, or combined component therapy, along with the number of units transfused. Patients were monitored for transfusion reactions, which were classified as acute or delayed immunological and non-immunological reactions.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS version 23.0. Categorical variables were expressed as frequencies and percentages, while continuous variables were summarized using means and standard deviations. Associations between predictors and outcomes were assessed using the chi-square test or Fisher's exact test for qualitative variables. Student's t-test or analysis of variance was applied for quantitative comparisons where appropriate. Odds ratios with 95% confidence intervals were calculated, and a p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: Ethical approval for the study was obtained from the Institutional Ethics Committee, Goa Medical College. Patient confidentiality was maintained by anonymizing all data prior to analysis, and no personal identifiers were included in the dataset. The study involved no deviation from standard clinical care and posed no additional risk to participants.

RESULTS

During the study period, a total of 145 patients who received blood transfusion were included, comprising 76 obstetric patients (52.4%) and 69 gynecological patients (47.6%). Gynecological patients were significantly older than obstetric patients ($p < 0.001$). No statistically significant differences were observed with respect to residence or BMI. Table 1 compares baseline sociodemographic characteristics between obstetric and gynecological patients who received blood transfusion.

Table 1. Sociodemographic profile of transfused obstetric and gynecological patients

Variable	Category	Obstetric (n=76)	Gynecology (n=69)	χ^2 (df)	p-value
Age group (years)	≤30	50 (65.8%)	17 (24.6%)	46.96 (2)	<0.001
	31–40	25 (32.9%)	19 (27.5%)		
	>40	1 (1.3%)	33 (47.8%)		
Residence	Rural	66 (86.8%)	54 (78.3%)	1.31 (1)	0.252
	Urban	10 (13.2%)	15 (21.7%)		
BMI	Underweight	16 (21.1%)	14 (20.3%)	0.04 (2)	0.981
	Normal	54 (71.1%)	49 (71.0%)		
	Overweight	6 (7.9%)	6 (8.7%)		

Severe anemia was significantly more common among gynecological patients, while obstetric patients were significantly more likely to have received prior hematinic therapy. Table 2 evaluates anemia severity and prior hematinic intake as predictors of transfusion.

Table 2. Clinical predictors: severity of anemia and hematinic intake

Variable	Category	Obstetric (n=76)	Gynecology (n=69)	χ^2 (df)	p-value
Anemia severity	Mild–Moderate	55 (72.4%)	24 (34.8%)	19.11 (1)	<0.001
	Severe–Very severe	21 (27.6%)	45 (65.2%)		
Prior hematinic intake	Yes	40 (52.6%)	5 (7.2%)	32.72 (1)	<0.001
	No	36 (47.4%)	64 (92.8%)		

Obstetric transfusions were predominantly for asymptomatic anemia or obstetric hemorrhage, whereas gynecological transfusions were largely due to pathological bleeding conditions and malignancies ($p < 0.001$). Table 3 outlines the clinical indications prompting transfusion in both patient groups, followed by a grouped statistical comparison in Table 4.

Table 3. Indications for blood transfusion

Indication	Obstetric (n=76)	Gynecology (n=69)
Asymptomatic anemia / preoperative correction	43 (56.6%)	7 (10.1%)
Postpartum hemorrhage	5 (6.6%)	0
Antepartum hemorrhage	9 (11.8%)	0
Abortion / ectopic pregnancy	13 (17.1%)	0
Intraoperative blood loss	6 (7.9%)	0
Abnormal uterine bleeding (COEIN)	0	21 (30.4%)
Fibroid	0	23 (33.3%)
Gynecological malignancy	0	14 (20.3%)
Other gynecological causes	0	4 (5.8%)

Table 4. Grouped comparison

Grouped indication	Obstetric	Gynecology	χ^2 (df)	p-value
Asymptomatic / correction	43	7	32.49 (1)	<0.001
Other clinical indications	33	62		

ABO blood group distribution did not differ significantly between obstetric and gynecological patients. Table 5 compares ABO blood group distribution between obstetric and gynecological patients.

Table 5. Distribution of ABO blood groups among transfused patients

Blood group	Obstetric (n=76)	Gynecology (n=69)	χ^2 (df)	p-value
A	19 (25.0%)	25 (36.2%)	3.60 (3)	0.308
B	29 (38.2%)	19 (27.5%)		
AB	10 (13.2%)	6 (8.7%)		
O	18 (23.7%)	19 (27.5%)		

The overall transfusion burden, measured by number of PRBC units transfused, was comparable between obstetric and gynecological patients. Table 6 assesses transfusion load by comparing the number of PRBC units transfused.

Table 6. Transfusion burden: number of packed red blood cell units

PRBC units	Obstetric (n=76)	Gynecology (n=69)	χ^2 (df)	p-value
1–2 units	57 (75.0%)	54 (78.3%)	0.07 (1)	0.790
≥3 units	19 (25.0%)	15 (21.7%)		

Transfusion reactions were rare, with no statistically significant difference in occurrence between the two groups.Table 7 summarizes immediate transfusion outcomes in both groups.

Table 7. Transfusion-related outcomes

Outcome	Obstetric (n=76)	Gynecology (n=69)	Test	p-value
Transfusion reaction	1 (1.3%)	0	Fisher's exact	1.000
No reaction	75 (98.7%)	69 (100%)		

DISCUSSION

Blood transfusion remains a vital yet resource-intensive intervention in obstetrics and gynecology. This study provides a comprehensive evaluation of predictors and immediate outcomes of blood transfusion in a tertiary care setting, highlighting differences in patient profiles, clinical indications, and transfusion decision-making between obstetric and gynecological patients.

Gynecological patients receiving blood transfusion were significantly older than obstetric patients, with nearly half of gynecological transfusions occurring in women older than 40 years. This age disparity reflects the natural epidemiology of gynecological conditions such as fibroids, abnormal uterine bleeding, adenomyosis, and malignancies, which predominantly affect women in later reproductive and peri-menopausal age groups [4,5]. In contrast, obstetric transfusions largely involved younger women in their reproductive years, consistent with earlier reports from India and other low- and middle-income countries [3,5].

No significant association was observed between place of residence or BMI and patient category, indicating that transfusion requirements in this cohort were driven primarily by clinical factors rather than baseline anthropometric or geographic characteristics. Similar findings have been reported in studies noted that rural predominance reflects hospital catchment areas rather than differential transfusion thresholds [2,5].

Severity of anemia emerged as a key predictor differentiating obstetric from gynecological transfusion recipients. Gynecological patients were significantly more likely to present with severe or very severe anemia, whereas obstetric patients were more commonly transfused in the mild-to-moderate anemia range. This finding aligns with the chronic nature of blood loss in gynecological disorders such as fibroids and abnormal uterine bleeding, which often result in prolonged iron depletion before presentation [4,13].

In contrast, obstetric transfusions frequently occurred in patients with moderate anemia, particularly in late pregnancy or the peripartum period, where physiological hemodilution, anticipated blood loss, and fetal considerations influence transfusion decisions [1,3]. Importantly, prior intake of hematinics was significantly higher among obstetric patients, suggesting better antenatal screening and iron supplementation programs compared to gynecological patients, who often present late with advanced anemia [6,13]. These findings support the role of patient blood management strategies emphasizing early detection and correction of anemia, especially in gynecological care pathways [6–8].

The indications for transfusion differed markedly between the two patient groups. Obstetric transfusions were predominantly related to asymptomatic anemia, antepartum hemorrhage, postpartum hemorrhage, abortion, and ectopic pregnancy. Hemorrhagic conditions remain a leading indication for transfusion in obstetrics worldwide and are a major contributor to maternal morbidity and mortality [1–3,12].

In contrast, gynecological transfusions were largely driven by abnormal uterine bleeding, fibroids, and gynecological malignancies. These findings are consistent with previous studies from India and Africa, where abnormal uterine bleeding and malignancy-related anemia account for a substantial proportion of gynecological transfusions [2,4,5]. The significantly higher proportion of transfusions for asymptomatic or preoperative correction in obstetric patients reflects a more proactive transfusion approach in pregnancy, often aimed at optimizing maternal reserves before delivery [11,13].

The distribution of ABO blood groups did not differ significantly between obstetric and gynecological patients, mirroring the general population blood group distribution in India [5]. This finding suggests that blood group variability did not influence transfusion practices or access to blood products in the present study. Similar observations have been reported in other institutional audits, where blood group distribution was reflective of regional donor demographics rather than clinical indication [2,5].

Assessment of transfusion burden revealed that most patients in both groups received one or two units of packed red blood cells, with no statistically significant difference between obstetric and gynecological patients. This finding suggests adherence to relatively restrictive transfusion practices, consistent with contemporary recommendations advocating judicious use of red blood cell transfusion [9,10].

The comparable transfusion burden across groups also indicates that, despite differences in clinical indications and anemia severity, clinicians exercised similar thresholds for unit escalation. This aligns with patient blood management principles that emphasize individualized assessment rather than disease-based transfusion triggers [6–8]. However, the presence of patients requiring three or more units underscores the ongoing need for structured massive transfusion protocols, particularly in obstetric hemorrhage and advanced gynecological disease [1,11].

Transfusion reactions were rare in this cohort, with only one acute immunological reaction documented and no significant difference between obstetric and gynecological patients. This low reaction rate is consistent with existing literature reporting transfusion reaction rates below 1–2% in monitored hospital settings [9,10]. The finding reinforces the safety of transfusion practices at the

study center, while also highlighting the importance of vigilant monitoring and hemovigilance systems to promptly detect and manage adverse events [7,14].

Collectively, these findings highlight that predictors of transfusion differ substantially between obstetric and gynecological patients, with anemia severity, age, and underlying pathology playing central roles. The results underscore the need for strengthened anemia screening and correction programs in gynecological patients, alongside continued emphasis on protocol-driven hemorrhage management in obstetrics. Integration of patient blood management strategies across both domains may further optimize transfusion practices, improve patient outcomes, and conserve scarce blood resources [6–8,13,14].

CONCLUSION

Blood transfusion remains an essential intervention in both obstetrics and gynecology, yet its predictors and indications differ substantially between these two patient populations. This study demonstrates that gynecological patients are more likely to be older and to present with severe or very severe anemia, often due to chronic pathological bleeding conditions such as abnormal uterine bleeding, fibroids, and malignancies. In contrast, obstetric transfusions commonly occur in younger women and are frequently driven by asymptomatic anemia, anticipated peripartum blood loss, and acute hemorrhagic events. Despite these differences, transfusion burden and immediate safety outcomes were comparable between groups, with low rates of transfusion reactions observed. The findings highlight the importance of early anemia detection, optimized hematinic therapy, and structured patient blood management strategies, particularly in gynecological care. Strengthening protocol-driven transfusion practices and integrating PBM principles across obstetric and gynecological services may enhance patient safety, improve outcomes, and promote judicious use of blood resources.

Declarations
Funding: None
Acknowledgements: None
Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. American College of Obstetricians and Gynecologists. Practice Bulletin No. 183: Postpartum hemorrhage. Obstet Gynecol. 2017;130(4):e168–e186. Available from: https://journals.lww.com/greenjournal/Fulltext/2017/10000/Practice_Bulletin_No__183__Postpartum_Hemorrhage.45.aspx
2. Kumaraswami S, Butwick A. Latest advances in postpartum hemorrhage management. Best Practice & Research Clinical Anaesthesiology. 2022 May 1;36(1):123-34.
3. Royal College of Obstetricians and Gynaecologists. Prevention and management of postpartum haemorrhage. Green-top Guideline No. 52. London: RCOG; 2016. Available from: https://www.rcog.org.uk/guidance/browse-all-guidance/green-top-guidelines/prevention-and-management-of-postpartum-haemorrhage-green-top-guideline-no-52/
4. Ubom AE, Begum F, Ramasauskaite D, Nieto-Calvache AJ, Oguttu M, Nunes I, Malel ZJ, Beyeza-Kashesya J, Wright A, FIGO Committee on Childbirth and Postpartum Hemorrhage. FIGO good practice recommendations on anemia in pregnancy, to reduce the incidence and impact of postpartum hemorrhage (PPH). International Journal of Gynecology & Obstetrics. 2025 Oct 1.
5. The Federation of Obstetric and Gynaecological Societies of India (FOGSI). Blood transfusion in obstetrics and gynecology: Guidance document. (2024) Available from: https://www.fogsi.org/blood-transfusion-in-obstetrics-and-gynecology/
6. World Health Organization. Patient blood management and clinical use of blood. Available from: https://www.who.int/teams/health-product-policy-and-standards/standards-and-

specifications/blood-and-products-of-human-origin/patient-blood-management-and-clinical-use-of-blood
7. World Health Organization. Guidance on implementing patient blood management to improve global health. Available from: https://www.who.int/publications/i/item/9789240104662
8. Song KH, Choi ES, Kim HY, Ahn KH, Kim HJ. Patient blood management to minimize transfusions during the postpartum period. Obstetrics & gynecology science. 2023 Nov;66(6):484-97.
9. Carson JL, Stanworth SJ, Guyatt G, et al. Red blood cell transfusion: 2023 AABB international guidelines. Jama. 2023 Nov 21;330(19):1892-902.
10. Trivella M, Roubinian N, Fergusson DA, Triulzi D, Dorée C, Hébert PC. Transfusion thresholds for guiding red blood cell transfusion. Cochrane Database of Systematic Reviews. 2021(12).
11. Royal College of Obstetricians and Gynaecologists. Blood transfusions in obstetrics. Green-top Guideline No. 47. Available from: https://www.rcog.org.uk/guidance/browse-all-guidance/green-top-guidelines/blood-transfusions-in-obstetrics-green-top-guideline-no-47/
12. Escobar MF, Nassar AH, Theron G, et al. FIGO recommendations on the management of postpartum hemorrhage 2022. International Journal of Gynecology & Obstetrics. 2022 Mar;157:3-50.
13. Shaylor R, Weiniger CF, Austin N, Tzabazis A, Shander A, Goodnough LT, Butwick AJ. National and international guidelines for patient blood management in obstetrics: a qualitative review. Anesthesia & Analgesia. 2017 Jan 1;124(1):216-32.
14. Kaserer A, Castellucci C, Henckert D, Breymann C, Spahn DR. Patient blood management in pregnancy. Transfusion Medicine and Hemotherapy. 2023 Jun 27;50(3):245-55.