

Research Article

Blood Transfusion Practices in Obstetrics & Gynecology - A 3-Year Retrospective Study at Ibri Regional Hospital, Oman

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Abstract

Blood transfusion is a critical intervention in obstetrics and gynecology, particularly for managing postpartum hemorrhage (PPH), abnormal uterine bleeding (AUB), and anemia. Optimizing transfusion practices is essential to minimize risks and improve resource utilization. To evaluate transfusion patterns, indications, and appropriateness in the Obstetrics and Gynecology Department at Ibri Regional Hospital, Oman, over a 3-year period. This retrospective observational study analyzed 422 transfusion cases (226 obstetric, 196 gynecologic) from January 2020 to December 2022. Data on patient demographics, transfusion indications, hemoglobin levels, blood component use, crossmatch-to-transfusion (C/T) ratio, and adverse reactions were extracted from medical and blood bank records. Descriptive statistics were performed using IBM SPSS Statistics. The results showed overall transfusion rate was 3.28%. Obstetric hemorrhage (66.8%), primarily PPH (80.1%), and anemia (33.1%) were the leading obstetric indications. In gynecology, Abnormal uterine bleeding (AUB) (48.5%) and early pregnancy complications (27.0%) predominated. The C/T ratio was 7.98, indicating inefficient blood utilization. Single-unit packed red blood cell (pRBC) transfusions were common (51.2%), and adverse reactions occurred in 0.94% of cases. Senior physicians made 96% of transfusion decisions, with informed consent documented in 60% of cases. While transfusion practices align with international standards, the high C/T ratio suggests a need for improved blood ordering protocols. Enhanced anemia management, patient blood management (PBM) strategies, and mandatory consent documentation are recommended to optimize transfusion practices.

Keywords

Blood Transfusion, Obstetrics, Gynecology, Postpartum Hemorrhage, Anemia, Crossmatch-to-Transfusion Ratio, Patient Blood Management

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1. Introduction

Blood transfusion is a cornerstone of obstetric and gynecologic care, addressing life-threatening conditions such as postpartum hemorrhage (PPH), severe anemia, and abnormal uterine bleeding (AUB). However, inappropriate use increases risks, including transfusion reactions, prolonged hospital stays, and resource strain [1, 2]. Global variations in transfusion practices reflect differences in clinical guidelines, resource availability, and institutional protocols [2]. Evidence-based, restrictive transfusion strategies, targeting hemoglobin thresholds of 7-8 g/dL, are increasingly advocated to minimize unnecessary transfusions [4, 5]. Preventive measures, including iron supplementation and antifibrinolytics, further reduce transfusion needs [9].

PPH remains the primary indication for obstetric transfusions, driven by rising cesarean rates, advanced maternal age, and hypertensive disorders [6]. In gynecology, major surgeries (e.g., hysterectomy, myomectomy) and AUB frequently necessitate transfusions [7]. The crossmatch-to-transfusion (C/T) ratio, a key indicator of blood utilization efficiency, highlights over-ordering when elevated (>2.5) [15].

This study evaluates transfusion practices at Ibri Regional Hospital, Oman, focusing on indications, blood component use, C/T ratio, and adverse reactions to inform evidence-based guidelines. Ibri Regional Hospital follows national Ministry of Health (MOH) protocols for obstetric blood transfusion. Omani PPH guidelines outline stepwise management and blood component use. These recommend maintaining Hb >80 g/L, platelets $>50 \times 10^9/L$, fibrinogen >2.0 g/L, PT/APTT $<1.5 \times$ normal during hemorrhage. Transfusion decisions also depend on ongoing blood loss and hemodynamic. During a massive obstetric hemorrhage (e.g. cumulative loss >1500 - 2000 mL or hypotension/tachycardia), transfusion is urgent. Oman guidelines advise activating a massive transfusion protocol once blood loss exceeds 2000 mL or blood pressure is severely low. Once activated, group O RhD-negative RBCs are given immediately if the patient's blood type is unknown [41].

2. Ethical Considerations

Ethical approval was obtained from the Institutional Research and Ethics Committee at Ibri Regional Hospital. Patient confidentiality was maintained, and data were anonymized.

2.1. Methods

This retrospective observational study analyzed 422 transfusion cases (226 obstetric, 196 gynecologic) from January 2020 to December 2022. Data on patient demographics, transfusion indications, hemoglobin levels, blood component use, crossmatch-to-transfusion (C/T) ratio, and adverse reactions were extracted from medical and blood bank records.

Descriptive statistics were performed using IBM SPSS Statistics.

All obstetric and gynecologic patients receiving blood or blood component transfusions (packed red blood cells [pRBCs], fresh frozen plasma [FFP], platelets, or cryoprecipitate) during the study period were included.

2.2. Data Collection

Data were extracted from medical and blood bank records using a structured form. Variables included demographics, gestational age (obstetric cases), clinical indications, hemoglobin levels pre- and post-transfusion, blood component types and quantities, transfusion decision-making, informed consent, and adverse reactions. Blood bank data provided the number of units requested, crossmatched, and transfused, enabling calculation of the C/T ratio.

2.3. Statistical Analysis

Descriptive statistics (frequencies, percentages) were generated using IBM SPSS Statistics (version [16.0.0]). The C/T ratio was calculated as the number of units crossmatched divided by units transfused.

3. Results

Transfusion Overview

Of 422 transfusion cases, 226 (53.6%) were obstetric, and 196 (46.4%) were gynecologic, with an overall transfusion rate of 3.28%. A total of 10,453 units were requested, 8,535 crossmatched, and 1,070 transfused, yielding a C/T ratio of 7.98 (Table 1).

Table 1. Blood Utilization Statistics (2020-2022).

Metric	Value
Total units requested	10,453
Total units crossmatched	8,535
Total units transfused	1,070
C/T ratio	7.98

Patient Demographics

Most obstetric transfusions (86.7%) occurred in women aged 20-40 years, with 1.3% in teenage pregnancies. In gynecology, 45.4% of cases were >40 years, and 11.7% were <20 years (Table 2).

Table 2. Age Distribution of Transfusion Cases.

Age Group	Obstetrics (n=226)	Gynecology (n=196)	Total (n=422)
≤20 years	3 (1.3%)	23 (11.7%)	26 (6.2%)
21-30 years	79 (35.0%)	26 (13.3%)	105 (24.9%)
31-40 years	117 (51.8%)	58 (29.6%)	175 (41.5%)
41-50 years	27 (11.9%)	81 (41.3%)	108 (25.6%)
>50 years	0 (0%)	8 (4.1%)	8 (1.9%)

Transfusion Indications

In obstetrics, hemorrhage (66.8%) was the leading indication, with PPH accounting for 80.1% (121/151) and antepartum hemorrhage (APH) 19.9% (30/151). Anemia prompted 33.1% of transfusions (Table 3). In gynecology, AUB (48.5%), early pregnancy complications (27.0%), and surgical procedures (12.2%) were primary indications (Table 4).

Table 3. Indications for Obstetric Transfusions (n=226).

Indication	Number	Percentage
Obstetric hemorrhage	151	66.8%
- Postpartum hemorrhage	121	80.1%
- Antepartum hemorrhage	30	19.9%
-- Placenta previa	14	46.7%
-- Abruptio placentae	16	53.3%
Anemia	75	33.1%

Table 4. Indications for Gynecologic Transfusions (n=196).

Indication	Number	Percentage
Abnormal uterine bleeding	95	48.5%
Abortion/molar pregnancy	43	21.9%
Ectopic pregnancy	10	5.1%
Gynecologic surgery	24	12.2%
Anemia	24	12.2%

Hemoglobin Levels

Severe anemia (Hb <7 g/dL) was prevalent in gynecology (47.9%) compared to obstetrics (23.0%). Moderate anemia (Hb 7-9.9 g/dL) dominated in obstetrics (61.5%). Transfu-

sions at Hb ≥10 g/dL occurred in 15.5% of obstetric and 8.7% of gynecologic cases, primarily due to intraoperative or postpartum hemorrhage (Table 5).

Table 5. Hemoglobin Levels at Admission.

Hb Level (g/dL)	Gynecology (n=196)	Obstetrics (n=226)
<7	94 (47.9%)	52 (23.0%)
7-9.9	85 (43.4%)	139 (61.5%)
≥10	17 (8.7%)	35 (15.5%)

Blood Component Use

Single-unit pRBC transfusions were administered in 51.2% of cases (57.5% obstetrics, 43.9% gynecology). Combined therapies (pRBC + FFP, 19.7%; pRBC + FFP + platelets, 1.9%) were used in 21.8% of cases (Table 6).

Table 6. Blood Component Use (n=422).

Component	Cases	Percentage
pRBCs only	329	78.0%
pRBCs + FFP	83	19.7%
pRBCs + FFP + Platelets	8	1.9%
pRBCs + FFP + Cryoprecipitate	1	0.2%
FFP only	1	0.2%

Decision-Making and Consent

Senior physicians (specialist or above) made 96.2% of transfusion decisions. Informed verbal consent was documented in 60.0% of cases.

Adverse Reactions

Adverse reactions occurred in 0.94% of cases (4/422), all mild (shivering, 75%; low-grade fever, 50%; maculopapular rash, 25%). No severe reactions (e.g., TACO, TRALI) were reported.

4. Discussion

The transfusion rate of 3.28% aligns with global averages (1.5-3% in high-income countries, 5-10% in low- and middle-income countries [LMICs]) [2, 14, 15]. This likely reflects the hospital's role as a secondary-level facility managing a moderate volume of hemorrhagic obstetric cases (notably PPH) and gynecologic conditions such as abnormal uterine bleeding (AUB), compounded by a notable prevalence of moderate-to-severe anemia on admission. The high C/T ratio (7.98) indicates inefficient blood utilization, exceeding the

recommended threshold of ≤ 2.5 [15]. This suggests over-ordering, possibly due to inadequate preoperative assessment or conservative blood bank practices. Implementing a Maximum Surgical Blood Ordering Schedule (MSBOS) and type-and-screen protocols could optimize resource use [26].

Obstetric transfusions were driven by PPH (80.1% of hemorrhage cases), consistent with global trends where PPH accounts for significant maternal morbidity [6]. Anemia, prevalent in 33.1% of obstetric cases, underscores the need for robust antenatal screening and iron supplementation [8]. In gynecology, AUB (48.5%) and early pregnancy complications (27.0%) were primary drivers, reflecting the burden of chronic and acute conditions [20]. 12.2% of gynecologic transfusions were administered solely for anemia correction, in the absence of active bleeding or surgical blood loss. Notably, only two patients received preoperative transfusion to correct anemia, reflecting a cautious and evidence-aligned transfusion policy. Instead, oral and intravenous iron supplementation is prioritized to optimize hemoglobin levels preoperatively, in accordance with modern patient blood management (PBM) strategies that recommend minimizing transfusions whenever feasible [11].

Single-unit pRBC transfusions (51.2%) align with restrictive transfusion guidelines, reducing risks without compromising outcomes [18, 19]. The low adverse reaction rate (0.94%) reflects adherence to MOH protocols and vigilant monitoring [5]. However, the 60% consent documentation rate highlights a gap in patient-centered care, as international guidelines mandate informed consent for non-emergency transfusions [39, 40].

5. Strengths & Limitations

The study's comprehensive inclusion of 422 cases, detailed hemoglobin data, and focus on institution-specific practices provide a robust foundation for benchmarking and guideline development. The large sample size enhances statistical reliability.

The retrospective design limits assessment of clinical judgment and documentation quality. Lack of a non-transfused control group hinders evaluation of transfusion appropriateness. The single-center setting may reduce generalizability, though findings are relevant to similar LMIC contexts. Consent quality was not assessed, and long-term outcomes were not tracked.

6. Recommendations

- 1) Implement PBM protocols emphasizing antenatal anemia correction and intraoperative blood conservation.
- 2) Adopt MSBOS and type-and-screen protocols to reduce the C/T ratio.
- 3) Mandate informed consent documentation for all non-emergency transfusions.

- 4) Conduct regular audits to monitor transfusion practices and compliance.
- 5) Enhance clinician training on transfusion thresholds and alternatives.

7. Conclusion

This study underscores the critical role of transfusions in managing obstetric and gynecologic emergencies while highlighting opportunities for improvement. The high C/T ratio and variable consent documentation suggest a need for stricter blood ordering protocols and enhanced patient engagement. Preventive strategies, including anemia management and PBM, can reduce transfusion dependency, improving safety and resource efficiency.

Abbreviations

PPH	Postpartum Hemorrhage
AUB	Abnormal Uterine Bleeding
C/T ratio	Crossmatch-to-transfusion Ratio
pRBC	Packed red Blood Cell
PBM	Patient Blood Management
MOH	Ministry of Health
FFP	Fresh Frozen Plasma
APH	Antepartum Hemorrhage
TACO	Transfusion Associated Circulatory Overload
TRALI	Transfusion Related Acute Lung Injury
LMICs	Low- and Middle-income Countries
MSBOS	Maximum Surgical Blood Ordering Schedule

Author Contributions

Houda Nasser Rashid Al Yaqoubi: Writing – original draft, Conceptualization, Methodology

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Badriya Ali Al Alawi: Writing – review & editing

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Farah Khan: Formal Analysis, Investigation, Software

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Conflicts of Interest

The authors declare no conflicts of interest.

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