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Patterns of blood and blood product use in obstetrics and gynecology: A prospective study in a tertiary care center

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Abstract
Background: Blood transfusion is an indispensable component of modern obstetric care, especially in managing complications such as postpartum hemorrhage and severe anemia. However, inappropriate or unnecessary transfusions can lead to increased patient risk, resource wastage, and strain on blood bank resources. This study aims to evaluate the current utilization patterns of blood and blood products in the Obstetrics and Gynecology department of a tertiary care hospital, with a focus on assessing appropriateness and identifying areas for improvement.
Materials and Methods: This prospective, observational study was conducted over 1.5 years at College of Medical Science Teaching Hospital Bharatpur, Nepal. All inpatients from the Department of Obstetrics and Gynecology who required blood transfusion during the study period were included. Data were collected using structured forms from blood request records and transfusion records. Key utilization indicators, including Crossmatch-to-Transfusion ratio (C/T ratio), Transfusion Probability (%T), and Transfusion Index (TI), were calculated and analyzed using Origin Pro version 8.0.
Results: Of the 330 patients for whom crossmatch requests were made, 200 patients (60.6%) received transfusions. A total of 745 units were requested, out of which 549 (73.6%) units were transfused. The most commonly transfused component was red blood cells (48.8%), followed by fresh frozen plasma (40.4%) and platelets (10.2%). Anemia complicating pregnancy was the most frequent indication for transfusion (51.5%), followed by Caesarean sections (26.1%). The C/T ratio was 1.65, reflecting moderately efficient blood utilization practices. However, 29% of transfusions were considered inappropriate based on hemoglobin levels, highlighting the need for stricter adherence to guidelines.
Conclusion: This study demonstrates that while transfusion practices are generally in line with clinical demands, there is a significant scope for improvement, especially regarding preemptive transfusions and the management of antenatal anemia. Implementing evidence-based guidelines and continuing medical education for clinicians can help optimize transfusion practices and conserve this critical resource.

Keywords: Blood transfusion, obstetrics, anemia, transfusion utilization, C/T ratio, maternal, health, evidence-based practice

Introduction

Blood transfusion therapy is a cornerstone in the management of various obstetric complications, including postpartum hemorrhage, antepartum hemorrhage, and severe anemia, which collectively contribute significantly to maternal morbidity and mortality worldwide. The World Health Organization (WHO) recognizes blood transfusion as one of the eight key components of Comprehensive Emergency Obstetric Care (EmOC), underscoring its critical role in managing maternal emergencies and preventing maternal deaths [1].

Despite its importance, blood transfusion is not without risks. Potential adverse outcomes include immunological reactions, transmission of infections, and fluid overload, making it imperative to use blood judiciously and only when clinically indicated [2]. Moreover, blood is a scarce and valuable resource, particularly in low- and middle-income countries, where supply often fails to meet demand [3]. Therefore, optimizing transfusion practices is not only a clinical imperative but also an ethical obligation to ensure patient safety and sustainable healthcare delivery.

Unfortunately, transfusion practices in obstetric settings are often guided by empirical assumptions rather than robust evidence. Many clinicians order cross matches for surgeries or deliveries "just in case," leading to unnecessary reservations of blood units that may expire unused, thereby straining blood bank resources [4]. Such practices can cause shortages for patients who genuinely need transfusions and increase the operational burden on blood banks.

This study was designed to critically evaluate the utilization of blood and its components within the Department of Obstetrics and Gynecology at a tertiary care hospital in India. By assessing transfusion practices against established benchmarks and identifying potential areas of overuse or misuse, this research aims to contribute to the development of safer, more efficient, and evidence-based transfusion protocols.

Materials and Methods

Study Design and Setting

This was a prospective, observational study conducted collaboratively by the Departments of Transfusion Medicine and Obstetrics and Gynecology at College of Medical Science Teaching Hospital Bharatpur, Nepal, over a period of 1.5 years.

Study Population

All inpatients in the Department of Obstetrics and Gynecology who required blood or blood products between April 2023 and September 2024 were included. Patients

who did not require transfusion but for whom crossmatch requests were made were also included to assess blood ordering practices comprehensively [5].

Data Collection

Data were collected using standardized data collection forms, extracting information from blood bank records and transfusion request forms. No direct patient interviews were conducted, preserving the study's observational nature. The following data were recorded:

- Demographic details (age, parity)
- Clinical diagnosis
- Hemoglobin levels at the time of transfusion request
- Type and number of blood components requested and transfused Indications for transfusion

Evaluation Metrics

Key transfusion indices were calculated as follows:

- **Crossmatch-to-Transfusion Ratio (C/T ratio):** Measures efficiency of blood utilization; optimal ratio is ≤2.5.
- **Transfusion Probability (%T):** Proportion of patients transfused among those crossmatched; a value ≥30% indicates efficient ordering.
- **Transfusion Index (TI):** Average number of units transfused per patient; a TI ≥0.5 reflects efficient utilization [6, 7].

Data Analysis

Collected data were compiled using Microsoft Excel and analyzed using Origin Pro 8.0 version. Descriptive statistics were used to present frequencies, percentages, and averages. Comparisons were made with recommended transfusion guidelines from international bodies such as the Royal College of Obstetricians and Gynaecologists (RCOG) [8].

Results

Out of 330 patients, the majority (74.5%) who received transfusions were aged 21–30 years (Figure 1). The highest utilization of blood components occurred in this age group (363 units transfused out of 487 requested) (Figure 2).

Table 1: Blood Product Use by Parity

Parity	No. of Patients	PRC#	PRC$	RDP#	RDP$	FFP #	FFP $	Cryo #	Cryo $
Primipara	115	153	92	14	12	80	78	2	2
Multipara	215	289	176	50	44	156	144	1	1

#Requested, $ Transfused

Table 2: Hemoglobin Levels and Corresponding Blood Utilization

Hemoglobin (g/dL)	Patients	Units Requested	Units Transfused
<6	30	60	52
6–7	42	66	53
7–8	44	67	59
8–10	71	89	54
>10	143	160	50

Blood Component Utilization

Of the 745 units requested, 549 were transfused (73.6%). Red blood cells accounted for 48.8% of transfusions, followed by fresh frozen plasma (40.4%) and random donor platelets (10.2%).

Clinical Indications

Anemia complicating pregnancy was the most frequent indication (51.5%) using 131 units of red cells, followed by Caesarean sections (26.1%) (Table 3). Ectopic pregnancies comprised 4.5% of cases.

Transfusion Indicators

- **C/T ratio:** 1.65 (Table 5)
- **Single-unit transfusion rate:** 45% (Table 4)
- **TI:** Varied by diagnosis (Table 3).

Table 3: Maximum Blood Order Schedule (MBOS)

Diagnosis	C/T Ratio	TI	Maximum Order
Anaemia	1.72	0.8	1.2
Caesarean Section	2.44	0.5	0.7
Ectopic Pregnancy	1.14	1.6	2.4

Demographic Characteristics

The study population consisted of 330 patients, aged 17 to 74 years. The majority (74.5%) of transfused patients were in the 21-30 years age group, aligning with the reproductive age range, which typically experiences the highest obstetric transfusion needs. (Figure-1)

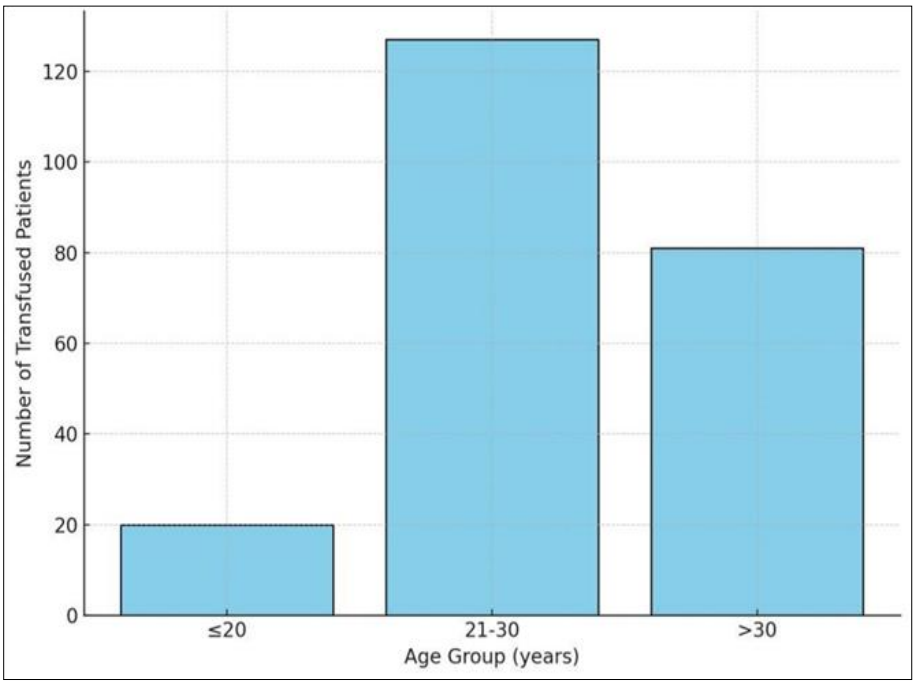

Fig 1: Age based Distribution of Transfused Patients n=330

Blood Component Utilization

Of the 745 units requested, 549 (73.6%) units were actually transfused, indicating moderate efficiency in blood utilization. Red blood cell concentrates were the most commonly transfused component (268 units; 48.8%), followed by fresh frozen plasma (222 units; 40.4%), and platelets (56 units; 10.2%). Only 3 units of cryoprecipitate were used. (Figure 2)

Clinical Indications

Anemia complicating pregnancy was the most common indication for transfusion, accounting for 51.5% of cases, highlighting the persistent burden of maternal anemia in India. Caesarean sections were the second most common indication (26.1%), underscoring the need for vigilant blood management during obstetric surgeries. Ectopic pregnancies accounted for 4.5% of transfusions.

Blood Ordering Practices

The overall C/T ratio was 1.65, indicating a relatively efficient ordering practice compared to studies reporting ratios of 5.46 to 7.4 in similar settings. However, discrepancies remain, as 29% of transfusions were found to be unnecessary (hemoglobin >10 g/dL), suggesting opportunities for improvement.

Single-Unit Transfusions

A significant number of transfusions involved only a single unit of red blood cells (45%). While single-unit transfusions can minimize risks, they may also indicate cautious or conservative transfusion practices rather than adherence to clinical triggers.

Parity and Transfusion Patterns

Multiparous women accounted for 65.2% of transfusions, receiving more units of red blood cells and plasma than primiparous women. This finding reflects the higher risk of postpartum hemorrhage and anemia in women with multiple pregnancies.

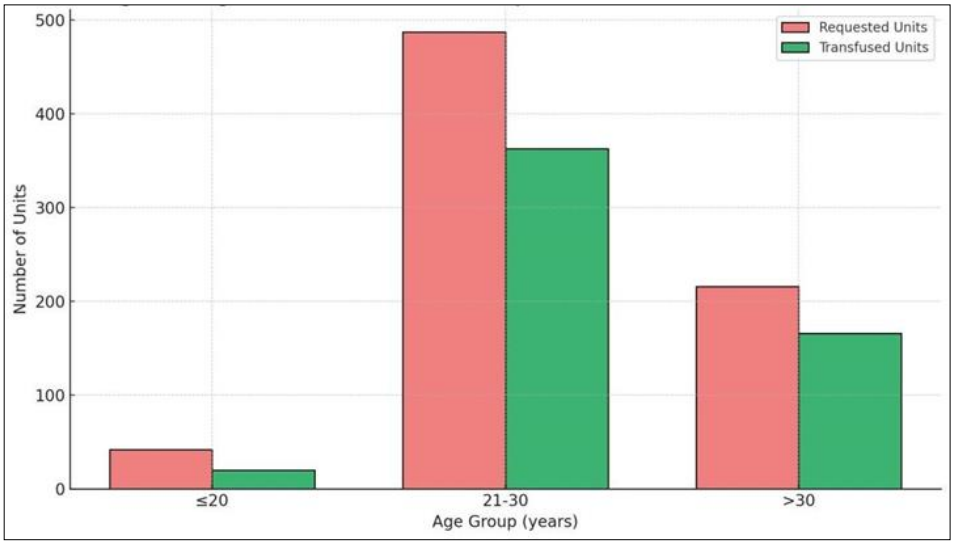

Fig 2: Age Based Distribution of Requested Vs. Transfused units (n=745)

Discussion

This study offers valuable insights into transfusion practices within a high-volume obstetric setting in a tertiary care hospital. The transfusion rate of 60.6% aligns with the expected high demand in centers managing high-risk pregnancies and complicated obstetric cases.

The study's C/T ratio of 1.65 is an encouraging finding, reflecting fairly efficient blood ordering compared to similar studies from Nigeria (C/T ratio 5.46), (C/T ratio 7.4), and Pakistan (C/T ratio 9.7) [9, 10, 11]. This highlights the importance of continued education and implementation of evidence-based transfusion thresholds, particularly focusing on avoiding transfusions in patients with stable hemoglobin levels above 10 g/dL unless there is ongoing bleeding or clinical symptoms. However, 29% of transfusions were unnecessary per RCOG guidelines, indicating opportunities for improvement through clinician education and protocol development.

The high rate of single-unit transfusions (45%) reflects a conservative transfusion strategy. While single-unit transfusions can be appropriate in some clinical scenarios, they should be coupled with close monitoring and reassessment to determine the need for additional units, thus minimizing the risks of unnecessary exposure to allogeneic blood.

Multiparous women's higher transfusion burden underscores the need for tailored blood management strategies for this subgroup, including targeted antenatal care and proactive management of postpartum hemorrhage risk.

This study highlights the significant reliance on blood transfusions in obstetric care, with a transfusion rate of 60.6%, consistent with tertiary centers managing high-risk cases. Anemia was the leading indication, reinforcing the need for robust antenatal anemia management to reduce transfusion dependence [15].

The high single-unit transfusion rate aligns with global trends towards conservative transfusion strategies but also highlights the need to ensure appropriate transfusion thresholds are consistently applied. Reference studies show a range of single-unit transfusion rates: 11.1%, 66.2% [12, 13, 14], and 43.1%.

Conclusion

This study emphasizes the importance of rationalizing transfusion practices in obstetrics and gynecology to optimize patient safety and resource utilization. Key recommendations include:

- Enhancing antenatal anemia screening and management to reduce the need for transfusions during pregnancy.
- Strict adherence to evidence-based transfusion thresholds to minimize unnecessary transfusions.
- Implementing targeted educational initiatives for clinicians to reinforce appropriate transfusion practices.
- Developing hospital-specific transfusion protocols that incorporate key performance indicators such as C/T ratio, %T, and TI to monitor and improve transfusion efficiency.

Effective management of antenatal anemia and adherence to evidence-based transfusion guidelines are essential for optimizing blood use. Hospitals should prioritize education, audits, and protocol development to reduce inappropriate transfusions and enhance patient safety. By adopting these measures, hospitals can ensure that blood—a precious, life-saving resource—is used judiciously, thereby improving maternal outcomes and strengthening the overall healthcare system.

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