



EVALUATION OF APPROPRIATE USE OF PACKED RED BLOOD
CELL, FRESH FROZEN PLASMA AND PLATLET TRANSFUSION
IN SPHMMC EMERGENCY DEPARTMENT

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EVALUATION OF APPROPRIATE USE OF PACKED RED BLOOD CELL, FRESH FROZEN PLASMA AND PLATLET TRANSFUSION IN SPHMMC EMERGENCY DEPARTMENT

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OCTOBER, 2022

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I affirm that I have cited and referenced all sources used in this document. Every effort has been made to avoid plagiarism in the preparation of this thesis.

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LIST OF ACRONYMS AND ABBREVIATION

AABB	<i>AMERICAN ASSOCIATION OF BLOOD BANKS</i>
BAL	<i>BRONCHO ALVEOLAR LAVAGE</i>
CAD	<i>CORONARY ARTERY DISEASE</i>
CKD	<i>CHRONIC KIDNEY DISEASE</i>
CNS	<i>CENTRAL NERVOUS SYSTEM</i>
DM	<i>DIABETES MELLITUS</i>
ENT	<i>EAR, NOSE AND THROAT</i>
FFP	<i>FRESH FROZEN PLASMA</i>
FMOH	<i>FEDERAL MINISTER OF HEALTH</i>
GI	<i>GASTROINTESTINAL</i>
HB	<i>HEMOGLOBIN</i>
HCT	<i>HEMATOCRIT</i>
HTN	<i>HYPERTENTION</i>
HIV	<i>HUMMAN IMMUNODEFFICIENCY VIRUS</i>
IDA	<i>IRON DEFICIENCY ANEMIA</i>
IHD	<i>ISCHEMIC HEART DISEASE</i>
MSK	<i>MUSKLOSKELETAL</i>
PRBC	<i>PACKED RED BLOOD CELL</i>
RBC	<i>RED BLOOD CELL</i>
RCC	<i>RED CELL CONCENTRATE</i>
SPHMMC	<i>SAINT PAUL MILLENNIUM MEDICAL COLLEGE</i>
TACO	<i>TRANSFUSION RELATED CIRCULATORY OVERLOAD</i>

TBC	<i>TRANSFUSION OF BLOOD COMPONENT</i>
TRALI	<i>TRANSFUSION RELATED LUNG INJURY</i>
TRIM	<i>TRANSFUSION RELATED IMMUNOMODULATION</i>
WHO	<i>WORLD HEALTH ORGANIZATION</i>

ABSTRACT

Background: The transfusion of blood components plays a fundamental role in the management of various pathologies and is a life-saving treatment. Blood is, however, an expensive and limited resource. Even though blood transfusion is a life-saving procedure that can improve health outcomes, there is limited literature on appropriate use of transfusion of blood components. This research aims to assess evaluation of appropriate use of blood components in SPHMMC adult ER over 04 months period of time.

Objectives: The objectives of this study are to evaluate appropriate use of red blood cell, fresh frozen plasma and platelet transfusion in those patients admitted on SPHMCC adult emergency room, from June 1, 2022 to September 29, 2022.

Methods: A four-month cross-sectional study was conducted at Saint Paul's hospital millennium medical college adult emergency room. All patients admitted to SPHMMC Adult ER from June 01, 2022, to September 29, 2022, who get blood transfusions are the study population. Data was collected using questionnaires and medical chart review for various clinical parameter of patients transfused during the study period in the form of a structured data abstraction tool and analyzed by SPSS version 26.0. Descriptive and analytical statistics were done. Transfusion appropriateness was assessed using criteria based AABB guidelines.

Results: totally 297 patients who got blood transfusion included. Female were 165(55.4%) and 132 (46.4%) males. 169 (56.9%) patients belong to age 18-39. Patients transfused PRBC were 261 (87.9%), platelet 68 (22.9%), FFP 33 (11.1%) and whole blood 19 (6.4%). The rate of inappropriate transfusions was 9.45%, 30.8% and 39.3% for PRBC, platelet and FFP respectively.

Conclusion: our finding on the prevalence of inappropriate blood transfusion shows similarity on some part of the world and inconsistency in other studies. The result of this study also shows the fact that there is inappropriate clinical use of blood transfusion of all components. In the future comprehensive guidelines should be implemented to improve the clinical appropriateness of blood transfusions.

Key words: transfusion, appropriate and inappropriate, PRBC, platelet, FFP

1. INTRODUCTION

1.1 Background

Richard Lower conducted, in 1665, in England, the first blood transfusion between animals. This procedure, then, was tested in humans in the following decades and is currently one of the most used therapies in the world. Blood transfusion is generally the process of receiving blood or blood products intravenously. Blood transfusion has become an irreplaceable means of clinical treatment. However, it can be the cause of increased mortality when prescribed without need(1, 2). According to a systematic review and meta-analysis published in 2015, compared with liberal strategies, restrictive transfusion strategies were associated with a reduction in the number of red blood cell (RBC) units transfused and number of patients being transfused, but disadvantageous outcomes seemed to be unaltered(3). Inappropriate blood use is when and how much blood is needed to the patient is incorrectly decided according to the national or international guidelines.

The transfusion of blood components plays a fundamental role in the management of various pathologies and is, sometimes, a life-saving treatment. Blood is, however, an expensive and limited resource; over the last 20 years there has been a progressive increase in demands for this product, mainly as a result of the advances in onco-hematological therapies like chemotherapy, radiotherapy, immunotherapy and the increase in major surgery.

The safety of the transfusion lies not only in the correct selection, preparation and administration of blood products, but also in the ability to correctly interpret when such intervention is appropriate. It is estimated that between 5 and 58% of transfusions are unnecessary(4). Although blood transfusion is a lifesaving therapy for some patients, transfusion has been named 1 of the top 5 overused procedures in US hospitals. As unnecessary transfusions only increase risk and cost without providing benefit, improving transfusion practice is an effective way of promoting high-value care. Most high-quality clinical trials supporting a restrictive transfusion strategy have been published in the past 5 to 10 years, so the value of a successful patient blood management program has only recently been recognized(5, 6).

Shrinkage of the donor pool coupled with an increasing demand for blood presents a major challenge to maintaining an adequate blood supply. Consequently, it has become even more important to reduce inappropriate blood use, including decisions about when and how much blood to prescribe(7).

The appropriate use of blood and blood components remains a formidable challenge faced by clinicians particularly in a developing country. The inadequate supply of safe blood implies that measures aimed at ensuring judicious use of the available supply should be continually identified and explored(8).

Despite the annual blood collections increased by 147% (65,681 units) in Ethiopia during 2011-2014 and similarly, voluntary, non-remunerated blood donor donations largely increased from 24% in 2011 to 88% in 2014, the rate of collections remained below WHO's minimum target for adequacy of 10 units per 1,000 population per year.

Though blood donor is life-saving practice, Ethiopia's current blood supply is far less compared to the demand (9).

1.2 Statement of the problem

While blood transfusion is a life-saving procedure that can improve health outcomes, its unnecessary use exposes recipients to potential hazards (e.g., infections and transfusion reactions), an increased risk of death, increases healthcare costs and reduces blood availability. The most common blood product transfused is red blood cells (RBCs). There is evidence of unnecessary RBC transfusion in studies worldwide with prevalence rates of 46% in the United Kingdom, 21.4% in Spain and 23% in Northern Ireland for adults, and of 55.5% in Uganda and 66% in South Africa for children(10).

Transfusion of red blood cells (RBCs) is a balance between providing benefit for patients while avoiding risks of transfusion. Randomized, controlled trials of restrictive RBC transfusion practices (hemoglobin <7mg/dl) have shown equivalent patient outcomes compared with liberal transfusion practices (to achieve hemoglobin of 10 irrespective of the cause), and meta-analyses have shown improved in-hospital mortality, reduced cardiac events, and reduced bacterial infections(11). Most high-quality clinical trials supporting a restrictive transfusion strategy have been published in the past 5 to 10 years, so the value of a successful patient blood management program has only recently been recognized(3, 11-13).

Data suggest that 30-90 % of plasma transfused are unnecessary and puts the patient at risk. Plasma transfusion is associated with a high risk of transfusion-associated adverse events such as transfusion-associated circulatory overload (TACO), transfusion-related lung injury (TRALI),

transfusion-related immunomodulation (TRIM), and anaphylaxis/allergic reactions. Therefore, the avoidance of inappropriate plasma transfusion bears a high potential of improving patient outcomes(14).

Platelets should be transfused appropriately, based on the cause of thrombocytopenia. The practice and policies of transfusion vary among institutions and even among clinical practitioners, leading to inappropriate use of platelets, which might increase the risk of transfusion-related complications to recipients, and lead to a shortage of platelets. An audit of platelet components helps to determine the effectiveness and appropriateness of their use and in improving transfusion practices(15).

This study will try assess the appropriateness of blood transfusion in SPHMMC emergency.

1.3 Significance of the study

Since there is limited literature on developing countries over the appropriate use of blood transfusion and also an increasing demand and consumption together with shortage of adequate blood donor in the Ethiopia, this research may help not only to decrease overuse and malpractice of blood transfusion but also save the county's blood cost.

Therefore, finding from this research could potentially be used to forward feedback to SPHMMC and FMoH to give direction on appropriate use of blood transfusion.

2. LITERATURE REVIEW

The medical records of a randomly selected sample in Northern Ireland hospital, during 2005 (n=1474) were reviewed, and it shows that 23% of transfusions were considered inappropriate, occurring most commonly where the lowest hemoglobin (Hb) threshold for transfusion applied. Younger patients, those undergoing surgery, and those with lower comorbidity and higher Hb values were most likely to have an inappropriate transfusion. Among patients appropriately transfused, 19% were over transfused. Females and those of lower weight (<65 kg) were most likely to be over transfused considering one unit of packed red blood cell increase the hemoglobin by 1mg/d(7).

A retrospective study was done in France emergency unit in 2014 and they used the French national guideline protocol on 193 patients during six-month periods. A protocol based on the French national guidelines (HAS) in 2014 was set up. The rate of appropriate blood transfusion was 81%. The inappropriate indications were more frequent with older patients and patients suffering from a stable coronary artery disease (16).

Multicenter, cross-sectional observational study in Spain aims to assess the appropriateness of red blood cell transfusion (RBCT) indications and transfused volumes in patients who attend ED. The study cohort is made up of consecutive consenting adult patients (≥ 18 years old) who received RBCT in ED over a 3-month period and for whom relevant clinical data were collected and analyzed. Overall, 584/1,433 (41%) of evaluable RBC units were unnecessarily transfused(5).

A retrospective medical chart review was performed in Canada emergency on iron deficiency anemia (IDA) patients over a three-month period. Appropriateness of RBC transfusion was determined using a novel algorithm developed by the institution. Over the study period, there were 49 patients with IDA who got RBC transfusion in the ED, of this 32% were inappropriate(17).

Retrospectively reviewed the clinical details including the platelet counts and hemorrhagic tendencies of dengue patients as well as the transfusion requirements of diagnosed dengue cases admitted in India. A total of 1,750 random donor platelet and 114 single donor platelet units were transfused to 531 patients. 23.2% platelet transfusions were found to be inappropriate(18).

A prospective 12-week audit of consecutive platelet transfusions using validated and evidence-based adjudication criteria was conducted in Cameroon. The aim was to determine platelet

transfusion appropriateness and common scenarios with deviations from guidelines. Fifty-seven (38%) of 150 hospitals provided data on 1903 platelet orders, representing 90% of platelet usage in the region during the time period. Overall, 702 of 1693 adult (41.5%) and 133 of 210 pediatric orders (63.3%) were deemed inappropriate. The most common inappropriate platelet order was for prophylaxis in the absence of bleeding or planned procedure in patients with hypo proliferative thrombocytopenia and a platelet count over $10 \times 10^9 /L$ (53% of inappropriate orders in adults and 45% in pediatrics) (19).

This was a retrospective, audit done at 5 hospitals in Gorgan city regarding the use of 1592 units of FFP issued to 346 patients from March 2006 to March 2007. The appropriateness of FFP transfusion was analyzed according to British Council for Standardization in Hematology (BCSH) Guidelines 2004. In this audit we identified a high rate of inappropriate FFP usage (53% of transfusion episodes). Most 'Inappropriate' FFP usage occurred when there was active bleeding, with normal (or unmeasured) coagulation tests (30% of transfusion episodes). In only 66% of FFP-transfused patients were coagulation variable measured at any point in the hospital episode(20).

A prospective study was done in Nigeria to evaluate all blood and blood component transfusions over a period of one year from January to December 2004 was assessed by a Hematologist. A total of 682 transfusion episodes were reviewed and analyzed. The commonest indication for use blood/blood component was severe anemia in 38% of cases. 29% percent of RBC transfusions, 36% of fresh frozen plasma transfusions and 81% of platelet transfusion were inappropriate(8).

Institution based cross-sectional study was conducted from February 1 to June 30, 2018 Jimma, Ethiopia. Transfusion appropriateness was assessed by a criterion-based method while blood utilization was calculated. A total of 545 units of blood for 425 patients were cross-matched of the 809 units of total blood prescribed. The mean and median age of transfused individuals was found to be 27.47 ± 15.28 years and 26 years respectively, and 65.4% females most in reproductive age groups. O and A Rhesus-positive blood types were the two major blood groups observed. Overall, 82.1% of transfusions were appropriate(21).

3. OBJECTIVES OF THE STUDY

3.1. General Objective

- To assess the appropriateness of RBCT, FFPT and Platelet transfusion on Saint Paul's hospital millennium medical college adult emergency room, Addis Ababa, Ethiopia, from June 01, 2022, to September 29, 2022.

3.2. Specific Objectives

- To assess the appropriateness of RBCT transfusion on Saint Paul's hospital millennium medical college adult emergency room, Addis Ababa, Ethiopia, from June 01, to September 29, 2022.
- To assess the appropriateness of Fresh frozen plasma transfusion on Saint Paul's hospital millennium medical college adult emergency room, Addis Ababa, Ethiopia, from June 01 to September 29, 2022.
- To assess the appropriateness of Platelet transfusion on Saint Paul's hospital millennium medical college adult emergency room, Addis Ababa, Ethiopia, from June 01 to September 29, 2022.

4. METHODOLOGY

4.1. Study Setting

This study was conducted in the adult ER of SPHMMC, which is located in, Addis Ababa, which is the capital city of Ethiopia. It was established by Emperor Haile Selassie I in 1969 to serve the poor. It has 350 beds and sees an average of 300,000 per annum. The hospital has a catchment population of more than 5 million. The medical college was formed in 2007. The ER has a red compartment with 4 labeled beds, orange compartment with 4 labeled beds as well, and yellow/green compartment which has an average of 12 beds.

4.2. Study design and Period

An institutional-based cross-sectional study was conducted from June 01, through September 29, 2022 by questionnaires and by reviewing the charts of admissions made to Saint Paul's hospital millennium medical college Adult Emergency Room from June 01, 2022, through September 29, 2022.

4.3. Population

4.3.1. Source Population

All patients admitted to Saint Paul's hospital millennium medical college adult emergency room from June 01, 2022, through September 29, 2022.

4.3.2. Study Population

All adult patients who got blood transfusion in Saint Paul's hospital millennium medical college adult emergency room from June 01, 2022, through September 29, 2022.

4.4. Eligibility criteria

4.4.1. Inclusion criteria

- Patients who are admitted to Saint Paul's hospital millennium medical college adult emergency room during the study period who got Blood transfusion of any components.

4.4.2. Exclusion criteria

- Those under the age of 18 years
- Those chart records with inadequate documentation

4.5. Sample size and sampling method

All those patients admitted to Saint Paul's hospital millennium medical college adult emergency room throughout 04 months (from June 01, 2022, through September 29, 2022) that fulfill the inclusion criteria will be the sample size.

The minimal sample size will be calculated as follows

Since the prevalence of the problem in the study is not well known in developing countries like Ethiopia, the P-value is taken as 50% (0.5) and 95% confidence interval was used, with a 5% margin of error tolerated, the sample size was determined by using single population proportion formula.

$n = (Z_{\alpha/2})^2 p (1-p) / d^2$ Where,

n- Required sample

Z- Standard normal value at 95% CI which is 1.96

p- Estimated population proportion which is 0.5

d- Possible margin of error tolerated which is 0.05

$n = \frac{(1.96)^2 0.5(1-0.5)}{(0.05)^2} = 384$

Since the source population is 2250, which < 10,000 is, a population correction formula was used to determine the adjusted minimum sample size.

$n_f = n / (1 + n/N)$ Where,

n= initial sample size was 384

N= total number of patients admitted during the study period

n_f – minimum sample size

Thus, $n_f = 384 / (1 + 2250/384) = 328$

By adding 10% drop out, the final sample size was = 360

4.6 Study variables

4.6.1 Dependent variables

- Appropriate use of blood transfusion

4.6.2 Independent variable

- Age
- Sex
- Clinical indication for blood transfusion
- Pretransfusion Hg, platelet and coagulation profile
- Anticoagulant drugs like warfarin, heparin
- Medical procedures
- Presence of comorbidities (IHD, ACS, cardiac failure)

4.7. Data collection tools and procedures

Structured and standardized data abstraction tool is developed in the English language which is adopted from the variables in the related literature review and some modifications done. The tool was tested for its validity. The data was collected through chart review and extraction by general practitioner and trained nurses.

4.8. Operational definitions

- **Blood transfusion** -. is the process of transferring blood products into a person's circulation intravenously.
- **Appropriate use** – correct use blood components based on the indication for blood transfusions.
- **Inappropriate use** – any transfusion which is not included on appropriate use of transfusion.

Table 4.8 Appropriate RBCT - AABB guideline(22) used to say appropriate

Condition	Hemoglobin threshold for transfusion
Acute bleeding	Transfuse at any Hg number
Preexisting CAD	8 g/dl
ACS, including acute MI	8-10 g/dl

GI bleeding (hemodynamically stable)	7 g/dl
Critically ill (hemodynamically stable)	7 g/dl
Oncologic patient on treatment	7 g/dl
Anemia with symptoms (for e.g., tachycardia, weakness, dyspnea on exertion)	8 g/dl

Table 4.8.1 Appropriate platelet transfusion – AABB guideline used(23)

Condition	Platelet transfusion threshold
Prevention of spontaneous bleeding	
Hypo proliferative thrombocytopenia	< 10,000
Febrile/septic patient	< 20,000 – 30, 000
Actively bleeding patient	< 50,000
CNS bleeding patient	< 100,000
Preparation for invasive procedures	
Endoscopic procedures	< 50,000
BAL	< 20,000 – 30,000
Central line placement	< 20,000
Lumbar puncture	< 10,000 – 20,000

Appropriate FFP Transfusion -

- ✓ For reversal of warfarin in the presence of bleeding where PCC is not available
- ✓ In case of massive transfusion
- ✓ Multiple coagulation factors are deficient like liver disease / DIC and patient actively bleeding

4.9. Data quality control and management

Data was collected by general practitioner and nurses who received training for a day and data abstraction tool was tested and supervision was conducted by the principal investigator on daily

basis throughout the data collection period. After completion of data collection, each data entry was checked for completeness by another assigned personnel.

4.10. Data analysis plans and procedures

After collection, data was cleared, coded, and entered into a computer by using Excel and exported to SPSS version 26.0.0 for analysis. Data analysis was included descriptive statistics, including frequency, percentage, mean and standard deviation (SD).

4.11. Ethical Consideration

Ethical clearance and approval to conduct this research was obtained from St. Paul's hospital millennium medical college institutional research review board, Addis Ababa. Permission was obtained from the department of emergency medicine and critical care. To ensure privacy, names and other personal identities was not used. Confidentiality was respected.

4.12. Dissemination of results

The results of the study will be reported to SPHMMC, Emergency medicine, and the critical care department and will also be presented to the medical and/or scientific community at different national and international meetings. Other ways of disseminating the finding may be through morning sessions to physicians and nurses involved in managing these patients as well as publishing to a journal.

5. RESULT

5.1 Sociodemographic characteristics

Among 297 patients transfused 165(55.4%) were female and 132 (44.6%) were males. Of these, 169 (56.9%) of patients were belong to the age group 18-39 years and 35 (11.8%) were age older than 65 years old. 141 (47.5%) of patients were from Oromia region, 98 (33.0%) from Addis Ababa, 25 (8.4%) from Amhara region and 23 (7.7%) from Debub. O+ were the most common blood group with 107 (36%) patients.

Table 5.1 sociodemographic characteristics of transfused patients

	variable	frequency	percent
Gender	Female	165	55.4
	Male	132	44.6
Age	18 -39	169	56.9
	40 - 65	93	31.3
	>65	35	11.8
Residency	Addis Ababa	98	33.0
	Oromia	141	47.5
	Amhara	25	8.4
	Debub	23	7.7
Blood group	O+	107	36.0
	O-	12	4.0
	B+	70	23.6
	B-	3	1.0
	A+	92	31.0
	A-	7	2.4
	AB+	6	2.0

5.2 Clinical characteristics of transfused patient

Majority of the patient, which is 69 (23.2%) had malignancy (onco-hematologic), 45 (15.2%) were CKD and 15(5.1%) had CLD. Those who had active bleeding were 55 (18.5%).

Table 5.2 clinical characteristics of blood transfused patients

Variable	Frequency	Percent
<i>Comorbidities</i>		
<i>CKD</i>	45	15.2
<i>CLD</i>	15	5.1
<i>HIV</i>	3	1.0
<i>DM</i>	6	2.0
<i>Malignancy</i>	69	23.2
<i>Cardiac</i>	13	4.37
<i>HTN</i>	7	2.4
<i>Other</i>	12	4.0
<i>Active bleeding</i>		
<i>GI</i>	26	9.76
<i>Pulmonary</i>	6	2.02
<i>GUS</i>	13	4.37
<i>ENT</i>	4	1.34
<i>MSK</i>	3	1.01
<i>Sepsis/ septic shock</i>	26	8.8
<i>Procedure done</i>		
<i>Lumbar puncture</i>	2	1.0
<i>UGI endoscopic</i>	5	1.7
<i>Types of blood components</i>		
<i>PRBC</i>	261	87.9
<i>FFP</i>	33	11.1
<i>Platelet</i>	68	22.9
<i>Whole blood</i>	19	6.4

5.3 Packed RBC transfusion and its appropriateness

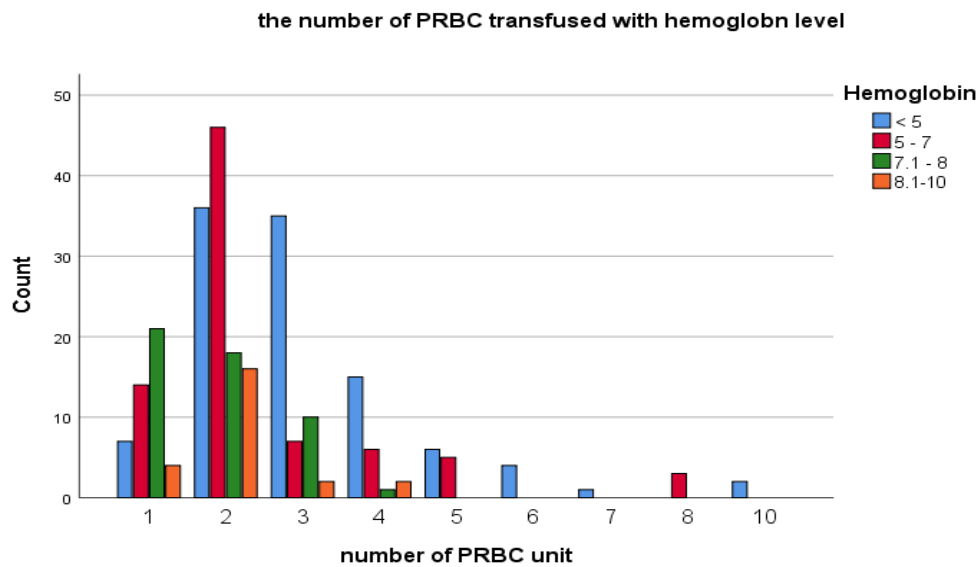
Overall, 261 patients transfused with 666 unit of PRBC. Female account for 143 (54.7%) of PRBC transfusion. 144 (55.2%) of patients presented with tachycardia, those presented with hypotension were 10 (3.8%). Gastrointestinal bleeding was the most common site of bleeding with 25 (9.51%). Onco-hematologic patients were 56 (21.5%).

Table 5.3 clinical characteristics and sociodemographic data of PRBC transfused patients

Variable	Frequency	Percent
N	261	
Female gender	143	(55.2)
Medical history		
CKD	44	(16.9)
CLD	10	(3.8)
HTN	7	(2.7)
CAD	5	(1.9)
Onco – hematologic	56	(21.5)
Active bleeding	48	(18.3)
Vitamin k antagonist	2	(0.8)
Sepsis/septic shock	20	(7.7)

Out of 666 packed RBC unit transfused 116 (44.4) patients transfused with 2 PRBC unit. 106 (40.6%) transfused with hemoglobin level < 5mg/dl, 81 (31.0%) transfused with hemoglobin level 5.1-7, 74 (28.3%) transfuse with hemoglobin > 7mg/dl. Patients presented with anemic symptom were 208 (79.6%). Based on algorithm analysis 63 (9.45%) PRBC unit were inappropriately transfused. Indication for transfusion were acute and chronic anemia 213 (81.6%) and active bleeding 48 (81.6%).

figure 5.3 correlation between hemoglobin level and units of PRBC transfused



Excluding those who had active bleeding the number of PRBC unit transfused has negative correlation $r = -.333$ with the level of hemoglobin with significant level of < 0.001 .

Correlations

		Hemoglobin	volume of PRBC
Hemoglobin	Pearson Correlation	1	-.333**
	Sig. (2-tailed)		.000
	N	216	213
volume of PRBC	Pearson Correlation	-.333**	1
	Sig. (2-tailed)	.000	
	N	213	213

** . Correlation is significant at the 0.01 level (2-tailed).

5.4 Platelet transfusion and its outcomes

Overall, 68 patients transfused with 326 platelets, of these 36 (52.9%) patients were female. Those who presented with bleeding were 25 (36.5%) and GI bleeding was the most common site with 13 (19.1%) patients. Sepsis or septic shock were presented on 4 (5.9%) patients.

Table 5.4 sociodemographic data and clinical characteristics of platelet transfused patient

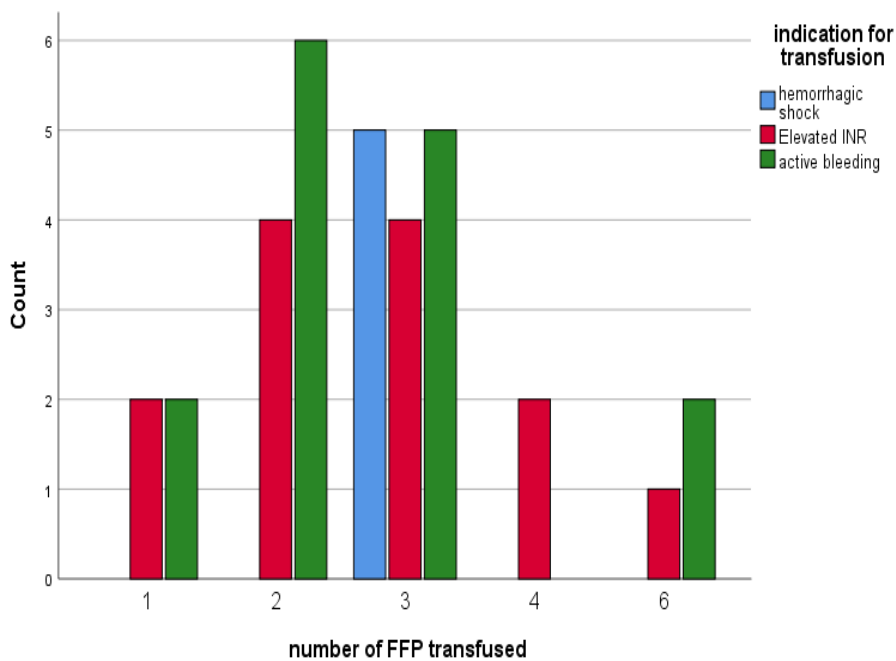
Variable	Frequency	Percent
N	68	
Female gender	36	(52.9)
Age (18-39)	36	(52.9)
Sepsis/septic shock	4	(5.9)
Active bleeding	25	(36.7)
UGI bleeding	13	(19.1)
GUS bleeding	5	(7.4)
Hemoptysis	4	(5.8)
Epistaxis	2	(2.9)
Endoscopic procedure	2	(2.9)
Pretransfusion platelet		
<10,000	36	(52.9)
10,000-50,000	28	(41.1)
50,000-100,000	1	(1.47)
>100,000	3	(4.4)

The median number of platelet unit transfused was 2 units. The majority transfused with two units 15 (22.1%). The most common indication was for prophylaxis in non-bleeding (63.2% of all order) patients. Out of 68 patients transfused, 21 (30.8%) patients were inappropriately transfused. 95 (29.1%) units out of 326 transfused platelet units were inappropriate based on AABB clinical practice guideline which is a systemic review(23).

5.5 FFP transfusion and its outcome analysis

Fresh frozen plasma was transfused on 33 patients, 21 (63.6%) were male. Those presented with active bleeding & hemorrhagic shock were 20 (60.6%) patients. The median FFP transfused was 2 units. Totally 92 plasma units transfused, 36 (39.3%) units of FFP were inappropriately transfused. The most common indication for inappropriately transfused patients were elevated INR.

Figure 5.4 FFP units transfused and their indications



6.DISCUSSION AND CONCLUSION

6.1 Discussion

Blood transfusion including all components has been recognized as lifesaving. Bloods are scarce and valuable treatment. Despite the common consensus that inappropriate blood transfusion is present there is a wide variation of finding with regard to its prevalence across studies held in different locations and setups using different study designs. This study assessed the prevalence of inappropriate blood transfusion PRBC, platelet and FFP at Saint Paul millennium medical college emergency.

The prevalence of inappropriate PRBC transfusion in this study is 9.45%. compared to other studies across some locations the prevalence of inappropriate transfusion of PRBC is lower than those done in Jimma, south west Ethiopia (17.9%), Nigeria (29%), in Spain (41%), France (19%), Northern Ireland (23%)(4, 16, 21, 24, 25).

The prevalence in this study is also lower compared to systemic review and metanalysis on the appropriate transfusion of red blood cell which is done in China (30.9%)(2). The observed differences could be due to difference in inclusion and exclusion criteria of the study participants, the guideline each study used to say appropriate and the sample size can be the contributing factor. For example, the study conducted in jimma includes all patients transfused in the jimma university hospital but department specific transfusion of PRBC shows emergency had higher appropriateness(21). In this study all bleeding patients considered to have appropriate PRBC transfusion without risk stratification but the study done in Spain emergency department for red blood cell transfusion used restrictive transfusion strategy for upper GI bleeding patients(4, 26) which may contribute to the underestimation of the true prevalence of PRBC transfusion in our study.

In this study the prevalence of inappropriate platelet transfusion is 30.8%. The finding in this study is almost consistent with African study done in Cameroon (41.5%)(19), in dengue India (23.2%)(18). Compared with other studies the prevalence of inappropriate platelet transfusion in this study is higher than systemic review and metanalysis done in China (14.1)(2) and in India

(9.1%)(27). The most common indication for inappropriate platelet transfusion is prophylaxis transfusion.

Platelet transfusions are used either prophylactically to reduce the risk of bleeding or therapeutically to control active bleeding. The American Association of Blood Banks (AABB) estimated that more than 70% of platelet transfusions were performed prophylactically(28). A national comparative audit of the use of platelets in UK by Qureshi *et al.* has reported 57% of platelet transfusions to be prophylactic(29), study done in India shows 73.8% indication were for prophylaxis. In our study, 63.2% platelet transfusion were for prophylaxis, which is similar to earlier studies.

Fresh frozen plasma was inappropriately transfused in 39.3% of the patient in our study. This study is consistent with studies done in Texas America (40%) and Nigeria (36%)(24). Compared with the other study on audit of inappropriate plasma transfusion which is done in India (22.3%)(30) the prevalence in this study is higher. Lower prevalence showed in this study compared to study done in England(20). This inconsistency on the prevalence of inappropriate transfusion of FFP is may be due to lack of evidence-based guidelines.

6.3 Limitation of the study

This study was the first study to assess the prevalence of inappropriate blood transfusion in the emergency department in Ethiopia. Therefore, the results of this study could be used as baseline data for further studies. However, the study has some limitations

- Because it uses a secondary data, some of the variables were not recorded which has led to omission of the variables from the questionnaire and then from analysis.
- All patient presented to the emergency with active bleeding considered unstable and this may underestimate the prevalence of inappropriate blood transfusion.
- The nature of the study design (i.e., being cross sectional) can prevent the clear assessment of whether the associated factors caused or resulted to inappropriate blood transfusion.

6.2 Conclusion

In conclusion, our finding on the prevalence of inappropriate blood transfusion shows similarity on some part of the world and inconsistency in other studies. The result of this study also shows the fact that there is inappropriate clinical use of blood transfusion of all components. In the future comprehensive guidelines should be implemented to improve the clinical appropriateness of blood transfusions.

6.4 Recommendation

For MoH and health institution

- Nationally in Ethiopia there is undersupply of blood due to so many reasons. We recommend the MoH of Ethiopia to establish a multidisciplinary task force and to implement comprehensive and specific evidence base guideline on all types of blood component transfusion indications.
- The health institution should have regular follow up on the implementation the guidelines and also expected to give appropriate tool on the appropriate transfusion of blood components.
- Both MoH and health institutions should encourage further researches on these topics.
- Health care professional should recognize the scarcity of blood supply and expected to exercise an updated transfusion guideline.

7. REFERENCES

1. Faria JCP, Cansian B, Arruda É EC, Victorino CA, Szulman A. Prescription of red cell concentrates by emergency physicians. *Rev Assoc Med Bras* (1992). 2020;66(4):466-71.
2. Zhu C, Gao Y Fau - Li Z, Li Z Fau - Li Q, Li Q Fau - Gao Z, Gao Z Fau - Liao Y, Liao Y Fau - Deng Z, et al. A Systematic Review and Meta-Analysis of the Clinical Appropriateness of Blood Transfusion in China. (1536-5964 (Electronic)).
3. Holst LB, Petersen MW, Haase N, Perner A, Wetterslev J. Restrictive versus liberal transfusion strategy for red blood cell transfusion: systematic review of randomised trials with meta-analysis and trial sequential analysis. *Bmj*. 2015;350:h1354.
4. Díaz MQ, Borobia AM, García Erce JA, Maroun-Eid C, Fabra S, Carcas A, et al. Appropriate use of red blood cell transfusion in emergency departments: a study in five emergency departments. (2385-2070 (Electronic)).
5. Díaz MQ, Borobia AM, García Erce JA, Maroun-Eid C, Fabra S, Carcas A, et al. Appropriate use of red blood cell transfusion in emergency departments: a study in five emergency departments. *Blood Transfus*. 2017;15(3):199-206.
6. Sadana D, Pratzner A, Scher LJ, Saag HS, Adler N, Volpicelli FM, et al. Promoting High-Value Practice by Reducing Unnecessary Transfusions With a Patient Blood Management Program. *JAMA Internal Medicine*. 2018;178(1):116-22.
7. Barr PJ, Donnelly M, Cardwell CR, Parker M, Morris K, Bailie KE. The appropriateness of red blood cell use and the extent of overtransfusion: right decision? Right amount? *Transfusion*. 2011;51(8):1684-94.
8. Arewa OP. One year clinical audit of the use of blood and blood components at a tertiary hospital in Nigeria. *Niger J Clin Pract*. 2009;12(4):429-33.
9. Nureye D, Tekalign E. Opportunities and Challenges of Blood Donation and Blood Therapy in Ethiopia. 2019.
10. Adedayo T, O'Mahony D, Adeleke O, Mabunda S. Doctors' practice and attitudes towards red blood cell transfusion at Mthatha Regional Hospital, Eastern Cape, South Africa: A mixed methods study. *Afr J Prim Health Care Fam Med*. 2021;13(1):e1-e8.
11. Salpeter SR, Buckley JS, Chatterjee S. Impact of more restrictive blood transfusion strategies on clinical outcomes: a meta-analysis and systematic review. *Am J Med*. 2014;127(2):124-31.e3.

12. Audet AM, Goodnough LT, Parvin CA. Evaluating the appropriateness of red blood cell transfusions: the limitations of retrospective medical record reviews. *Int J Qual Health Care.* 1996;8(1):41-9.
13. Goodnough LT, Panigrahi AK. Blood Transfusion Therapy. *Med Clin North Am.* 2017;101(2):431-47.
14. Görlinger K, Saner FH. Prophylactic plasma and platelet transfusion in the critically ill patient: just useless and expensive or even harmful? *BMC Anesthesiol.* 2015;15:86.
15. Chenna D, Shastry S, Baliga P. Use of platelet components: An observational audit at a tertiary care centre. *Natl Med J India.* 2022;34(4):197-200.
16. Langlais ML, Dargère M, Le Niger C, Goetghebeur D. [Appropriate use of red blood cell transfusion in the emergency department before and after a specific protocol]. *Transfus Clin Biol.* 2019;26(1):38-47.
17. Spradbrow J, Lin Y, Shelton D, Callum J. Iron deficiency anemia in the emergency department: over-utilization of red blood cell transfusion and infrequent use of iron supplementation. *Cjem.* 2017;19(3):167-74.
18. Chaurasia R, Zaman S, Chatterjee K, Das B. Retrospective Review of Platelet Transfusion Practices during 2013 Dengue Epidemic of Delhi, India. *Transfus Med Hemother.* 2015;42(4):227-31.
19. Hill-Strathy M, Pinkerton PH, Thompson TA, Wendt A, Collins A, Cohen R, et al. Evaluating the appropriateness of platelet transfusions compared with evidence-based platelet guidelines: An audit of platelet transfusions at 57 hospitals. *Transfusion.* 2021;61(1):57-71.
20. Mirzamani N, Molana A, Poorani E. Evaluation of appropriate usage of fresh frozen plasma: Results of a regional audit in Iran. *Transfus Apher Sci.* 2009;40(2):109-13.
21. Feyisa T, Tesfaye Kiya G, Maleko WA. Assessment of recipients' characteristics, transfusion appropriateness, and utilization pattern of blood and blood products in Jimma Medical Center, Jimma, Ethiopia. *PLoS One.* 2021;16(4):e0250623.
22. Carson JL, Guyatt G, Heddle NM, Grossman BJ, Cohn CS, Fung MK, et al. Clinical Practice Guidelines From the AABB: Red Blood Cell Transfusion Thresholds and Storage. *JAMA.* 2016;316(19):2025-35.

23. Kaufman RM, Djulbegovic B, Gernsheimer T, Kleinman S, Tinmouth AT, Capocelli KE, et al. Platelet transfusion: a clinical practice guideline from the AABB. *Ann Intern Med.* 2015;162(3):205-13.
24. Arewa OP. One year clinical audit of the use of blood and blood components at a tertiary hospital in Nigeria. (1119-3077 (Print)).
25. Barr PJ, Donnelly M Fau - Cardwell CR, Cardwell Cr Fau - Parker M, Parker M Fau - Morris K, Morris K Fau - Bailie KEM, Bailie KE. The appropriateness of red blood cell use and the extent of overtransfusion: right decision? Right amount? (1537-2995 (Electronic)).
26. Villanueva C, Colomo A, Bosch A, Concepción M, Hernandez-Gea V, Aracil C, et al. Transfusion Strategies for Acute Upper Gastrointestinal Bleeding. *New England Journal of Medicine.* 2013;368(1):11-21.
27. Chenna D, Shastry S, Baliga P. Use of platelet components: An observational audit at a tertiary care centre. *Natl Med J India.* 2021;34(4):197-200.
28. Strauss RG, Blanchette VS, Hume H, Levy GJ, Schloz L, Blazina JF, et al. National acceptability of American Association of Blood Banks Pediatric Hemotherapy Committee guidelines for auditing pediatric transfusion practices. *Transfusion.* 1993;33(2):168-71.
29. Qureshi H, Lowe D, Dobson P, Grant-Casey J, Parris E, Dalton D, et al. National comparative audit of the use of platelet transfusions in the UK. *Transfus Clin Biol.* 2007;14(6):509-13.
30. Kumar S, Kushwaha N, Tomar A, Philip J, Biswas AK. A retrospective audit to evaluate the appropriateness and rationalization of Fresh Frozen Plasma usage in a tertiary care hospital. *Medical Journal Armed Forces India.* 2022;78:S226-S31.

ANNEX

Questionnaires

Sociodemographic

1. ID MRN -----
2. Age in years
 1. 17 -40
 2. 40 – 65
 3. > 65
3. Sex
 - A. Female
 - B. Male
4. Address
 - a. AA 2. Oromia 3. Amhara 4 debub. 5. other
5. Patient blood group - 1. O+ 2. O- 3.B- 4. B+ 5. A- 6.A+ 7. AB- 8. AB+

Clinical presentation

- 6 Mode of arrival 1) ambulance 2) public transport 3) walking 4) other-----
- 7 Triage categories 1. Y/G 2. orange 3. red
- 8 Primary complaint 1) pain 2) fever 3) bleeding 4) Shortness of breath 5) easy fatigability 6. Other

Patient vital signs at presentation

9. BP 1. <139 2. 140-159 3. >160 4. <90
10. PR 1. <60 2. 60-100 3.> 100
- 11 RR 1. <12 2. 12-24 3. >24
12. Temperature 1. < 36 2. 36- 37.5 3. > 37.5

Questions on blood transfusion

13. Types of blood component
 1. PRBC
 2. FFP
 3. Platelet
 4. Whole blood
14. number of units of for specific component

15. What is the indication for transfusion?

- i. hemorrhagic shock
- ii. severe anemia
- iii. septic shock
- iv. elevated INR
- v. thrombocytopenia
- vi. active bleeding
- vii. severe anemia and thrombocytopenia

16.

	Pre transfusion	Post transfusion
Hemoglobin	1. <5 2. 5-6.9 3. 7-8 4. >8	1. <5 2. 5-6.9 3. 7-8 4. >8
Platelet	1. <5000 2. 5000 -10000 3. 10000-50000 4. 50000- 100000 5. >100000	1. <5000 2. 5000 -10000 3. 10000-50000 4.50000- 100000 5. >100000
Coagulation profile (INR)	1. <1.4 2. 1.4- 2 3. 2-4 4. 4-10	1. <1.4 2. 1.4 – 2 3. 2-4 4. 4-10

16. Does the patient have anemic symptoms?

1. yes 2. No

17. if yes which symptoms does the patient has (you can choose more than one)

- 1. Easy fatiguability
- 2. syncope
- 3. shortness of breath

- 4. Pale or yellowish skin.
- 5. Irregular heartbeats.
- 6. Dizziness or lightheadedness.
- 7. other

17 Does the patient have active bleeding?

1 yes 2 no

18 If the answer is yes for question no 17 site of bleeding?

- a. GI
- b. CNS
- c. MSK
- d. pulmonary
- e. GUS
- f. ENT
- g. OTHER....

19. does the patient have sepsis or septic shock?

1. yes 2. No

20. any anticoagulant medications he took?

- A. Warfarin
- B. No anticoagulant
- C. Enoxaparin
- D. Heparin
- E. rivaroxaban
- F. other mention

19 Does the patient have any underlying cardiac illness?

- A. IHD
- B. ACS
- C. CRVHD

- D. cardiomyopathy
 - E. Other cardiac illness
 - F. NO cardiac illness
21. procedure done on emergency department during the patient stay?
- 1. Lumbar puncture
 - 2. No procedure
 - 3. Central line insertion
 - 4. Endoscopic procedure
 - 5. BAL
- 20 What comorbidities does the patient have?
- A. CKD
 - B. DM
 - C. HTN
 - D. Malignancy
 - E. HIV
 - F. CLD
 - G. Othes.....
 - H. No comorbidity
- 21 How do you classify the patients' stability?
- A. Stable
 - B. Unstable
26. If unstable describe the parameter that makes the patient unstable
- 1. SO2
 - 2. BP
 - 3. RR
 - 4. GCS
 - 5. So2 and BP
 - 6. All component