Addis Ababa University

College of Health Sciences

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Blood and Blood Component Wastage Rate: Associated Factors in Ethiopia Blood and Tissue Bank Service and Selected Hospitals, Addis Ababa, Ethiopia.

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This is to certify that the thesis prepared by Saron Tamire entitled: "Blood and Blood Component Wastage Rate:Associated Factors in Ethiopia Blood and Tissue Bank Service and Selected Hospitals, Addis Ababa, Ethiopia". Submitted in partial fulfillment of the requirements for the Master of Science degree in Clinical Laboratory Sciences (Laboratory Management and Quality Assurance) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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List of Abbreviations/ Acronyms

CI	Confidence Interval
EBTBS	Ethiopia Blood and Tissue Bank Service
ETB	Ethiopian Birr
FEFO	First Expire First Out
FIFO	First in First Out
FFP	Fresh Frozen Plasma
HBsAg	Hepatitis B Surface Antigen
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
ICU	Intensive Care Unit
MCM	Myungsung Christian Medical Center
PC	Platelet Concentrate
PRBCs	Packed Red Blood Cells
SPSS	Statistical Package for Social Sciences
TASH	Tikur Anbessa Specialized Hospital
TTI	Transfusion Transmitted Infection
WB	Whole Blood
WHO	World Health Organization

Abstract

Background: Blood is an invaluable resource essential to human survival, making blood transfusion a critical, life-saving procedure: therefore:- blood transfusion can be a life-saving intervention. Discarding or wastage of blood can be attributed to several reasons namely expiration, Transfusion Transmitted Infection, storage problems, inaccurate volume collection, broken bags and seal with leakage, hemolytic reasons, clotted blood, lipemia, greenish or yellowish, discoloration, contamination, returned after 30 min and not used ordered blood. The main aim of this study is to assess the rate of blood wastage and associated factors at Ethiopia Blood and Tissue Bank Service and selected hospitals in Addis Ababa, Ethiopia during 2024/2025.

Methods: A facility-based cross-sectional study was conducted in Ethiopia Blood and Tissue Bank Service and selected hospitals in Addis Ababa. Three-month retrospective and three-month prospective data were collected by using a structured checklist from November 2024 to April 2025. The total blood and blood components issued were 84,501 units. A questionnaire was developed from assessment tools and a total of 105 professionals were participated. After verifying the completeness, the data were coded and entered into SPSS software for analysis. The association of variables was also analyzed using a bivariate and multivariate logistic regression analysis. Three key personnel were interviewed for qualitative data and analyzed using a thematic approach to illustrate the findings.

Result: A total of 48,235 units of blood were collected in Ethiopia Blood and Tissue Bank Service within six months. Of the total blood units 31,444 were kept as Whole Blood, and the remaining 16,791 blood units were made into components such as 16,207 Packed Red Blood Cells, 14,115 Platelet Concentrate and 14,115 Fresh Frozen Plasma. The total numbers of blood units issued during the study period were 75,881 from this blood wastage rate was 7,738 (10.15%) with 8,298,866.68 Ethiopian birr from November 2024 to April 2025; The highest wastage was observed in Fresh frozen plasma 3,355 (4.4%) units discarded, followed by Whole Blood 2,812 (3.7%), Platelet Concentrate 1,075 (1.4%), and PRBC 496 (0.65%). A total of 8,620 blood units were received by Tikur Anbessa Specialized Hospital and Myungsung Christian Medical Center within six months. Of the total of blood units received:- 1,556 were whole blood, 3,140 were Packed Red Blood Cells, 2,499 were Platelet Concentrate, and 1,425 were Fresh frozen plasma of

this blood wastage rate was 229(2.6%), with 245,638.24 Ethiopian birr from November 2024 to April 2025. The highest wastage was observed in whole blood 93(1%) followed by Fresh Frozen Plasma 66(0.7%), Packed Red Blood Cell 40(0.46%), and Platelet Concentrate 30(0.34%). Expiry date, Transfusion Transmitted Infection, Improper storage, Inaccurate blood collection volume, and Lack of pediatric blood bag show a significant association with blood wastage rate, $P < 0.05$.

Conclusion: The study found a blood and component wastage rate of 10.15% at EBTBS and 2.65% at selected hospitals, with a total cost of around 8.5 million ETB from November 2024 to April 2025. From the components, Fresh frozen plasma had the highest wastage rate. Key factors associated with wastage included expired units, transfusion-transmitted infections, improper storage, inaccurate collection volume, and lack of pediatric blood bags. Notably, the discard of partially used pediatric units due to the absence of pediatric bags was a significant issue, highlighting a critical gap affecting a vulnerable patient group.

Keywords: *Blood Units, Blood Components, Blood Wastage Rate.*

1. Introduction

1.1 Background of the Study

Blood is a specialized body fluid in the circulatory system, which delivers necessary substances to the body's cells, such as nutrients and oxygen and transports waste products away from these same cells (1, 2).Whole blood, composed of cells, colloids, and crystalloids, can be fractionated into distinct components, including packed red blood cell (PRBC) concentrate, platelet concentrate (PC), fresh frozen plasma (FFP) and cryoprecipitate. Each blood component is used for a different indication (1). In transfusion medicine, the separation storage of these components has made therapeutic interventions more effective and efficient, especially for cases like anemia and coagulation disorders (3).

Blood is an invaluable resource essential to human survival, making blood transfusion a critical, life-saving procedure therefore; blood transfusion can be a life-saving intervention (4). Transfusion of safe blood and blood products are an integral part of patient management (5). Human blood remains irreplaceable, making every unit a vital resource that must be utilized wisely (2). Nevertheless, blood banks face challenges in carrying on their inventory due to the bounded shelf life of blood components. Discarding or wastage of blood can be attributed to several reasons namely expiration due to non-utilization, TTI infections, storage problem, incorrect collection volume underweight or overweight, broken bags and seal with leakage, hemolytic reasons, clotted blood, lipemia, greenish or yellowish (icterus), discoloration, contamination, returned after 30 min, non-usage of ordered blood and miscellaneous others (6-10).

Blood banks worldwide work with the main aim of providing safe and sufficient blood and blood components need to put enormous efforts to collect a sufficient amount of safe blood from voluntary unremunerated, healthy, and low- risk donors. Since blood cannot be manufactured artificially therefore, efficient use of resources is required to collect whole blood and component preparation (11) therefore, implementation of rigorous protocol on blood reserves is proper and timely utilization of blood products is essential, and this can be achieved through clear protocol definition, enhanced coordination, and measures to minimize waste.

Addressing the gap between blood supply and demand requires either expanding resources for collection and production or optimizing the efficient use of existing resources. Every unit of blood is invaluable and must be used responsibly to minimize waste (12).

To optimize resource utilization and minimize blood wastage, it is important to understand the fine distinction of blood components, which also serves as a critical quality indicator in blood banks globally (13).

The main aim of this study is to determine the rate of blood wastage and to assess the associated factors at EBTBS and selected hospitals.

1.2 Statement of the Problem

Wasting of blood and blood components is an inefficient use of resources. Such wasted components may result in a significant loss of money and loss of a precious resource for patients and the problem is more severe in resource-limited settings (12). There is always a gap between the demand and supply of blood, which becomes worse when not using available resources efficiently and efficiently (13).

Delays or denial of transfusions to patients in critical need can be examples of the disruption caused in medical care, showing that its consequences extend beyond financial losses. The addition of delays on top of insufficient blood collection can undermine the credibility of healthcare institutions. The systemic challenges faced in developing countries like resource limitations and inconsistent policies, further intensify the issue (4).

Blood transfusion is an essential component of healthcare. A study estimated that India is in need of 52.5 million units of blood components, with a deficiency of 40.9 million. An insufficient blood supply for transfusion has a negative impact on the effectiveness of key health services (14).

In this regard, a joint press conference held by the Ministry of Health and the National Blood Bank stated that the blood deficit had reached a critical stage over the period, as less volume of donated blood was collected. Consequently, the Blood Bank was unable to supply the necessary volume of donated blood to hospitals and health centers, causing their patients to suffer even more (15).

Therefore ensuring an adequate and safe blood supply has become a major challenge in Ethiopia (16).

Wastage rates commonly run from 1% to 5%. Put in perspective, a 1% to 5% wastage rate of the 21 million blood products transfused annually in the United States amounts to 200,000 to 1 million wasted units, at a cost of $46 million to $230 million. Equally important is the loss of a scarce and precious resource contributed by volunteer donors,which makes this issue more concerning in developing countries (17). Discard rate of Blood is also one of the ten quality indicators defined by the National Accreditation Board of Standards and Health Care and reflects quality assurance of the system (18).

This study focuses on determining the rate and associated factors of blood and blood component wastage at the EBTBS and selected hospitals in Addis Ababa, including Tikur Anbessa Specialized Hospital (TASH) and MCM Comprehensive Specialized Hospital. There is a study gap within this area in Ethiopia. The study makes contribution by providing insights into blood and blood component management and offers recommendations for reducing wastage. These improvements recommended by the World Health Organization, will ensure the efficiency of blood usage, ultimately saving lives and enhancing patient outcomes (19).

1.3 Significance of the Study

The findings of this study enable us to propose an appropriate strategy in EBTBS and also in hospitals to minimize the blood and blood components wastage rate. The study will be useful to the hospitals to establish some protective measures against inappropriate use of blood, such as inappropriate storage conditions and weak inventory management of blood, and also to improve proper blood utilization services performance by analyzing the data and the reason for the discards can help develop plans thereafter to train staff and introduce measures in order to minimize the discard of this priceless resource to a reasonable rate.

By identifying the rate and associated factors of blood wastage, it plans to recommend policies and practices that improve the efficiency of blood management systems at EBTBS and hospitals helps to furthermore research and initiatives aimed at optimizing blood utilization and minimizing waste in the Ethiopian healthcare system.

2. Literature Review

A significant challenge for blood transfusion services around the globe is posed by the discarding of blood and its components, known as blood wastage (20). Regularly assessing discarded practices is an important way to identify gaps and minimize unnecessary wastage of blood and blood components so as to effectively manage such scarce resources (21, 22).

2.1 Rate of Blood and Component Wastage

A 5-year cross-sectional retrospective study in Sanjay Gandhi at Tertiary Trauma Care Centre shows that out of 22,401 total units of whole blood and its components, 1310 units were discarded accounting for 5.85%. Platelet concentrate (PC) was a commonly discarded component (18.3%), followed by whole blood (6.1%), Packed red blood cells (3.64%), and fresh frozen plasma (FFP) (2.92%) (23).

In a 7-year study from the total of 13728 blood units received during the specified period the wastage rate was 18.5% which included whole blood (11.7%), red cell concentrate (41.5%), fresh frozen plasma (41.6%), platelet concentrate (4.4%), and single donor plasma (0.6%) in South Delhi tertiary teaching hospital. Wasted were 53.7% of the concentrated platelet units. The wastage rate of whole blood and its components was 29.3% and 26.3% respectively (20).

In Guyana public hospitals, 25.4 % of blood units were wasted. Blood units wasted during the years 2014, 2013, and 2014 were recorded as 30.1 %, 26.4 %, and 23.4 % respectively. Platelets and the O+ blood group were the most commonly discarded blood components (24).

A study conducted in Iranian hospitals the total wastage rate of blood was 9.8%, and around 77.9% of red blood cell suspensions were discarded because of expiration. Based on hospital data, blood product waste ranges from 1.93% to 30.7%. Across all hospitals, the average blood product waste was 9.8%. It was determined that total blood and blood product (red blood cell suspension, plasma, platelets, and cryoprecipitate) waste was 3048 units (22).

In Iran approximately, 11%, 6%, and 21.5% of FFP, platelets, and PRBC units were discarded in the hospitals, respectively. The highest rate of blood component wastage belonged to burns (23%), ICU (22%), surgery (20%) and Thalassemia (20%) departments (8).

The blood bank of BP Koirala Institute of Health Sciences, Dharan a total of 1641 units of blood component were included in the study. A total of 92.9%(1524 units) were used and 7.13%(117 units) were wasted. (24).

2.2 Associated factors of Blood and Blood Component Wastage

Blood and blood component wastage remains a determined challenge in healthcare systems worldwide, especially in resource-limited settings. Numerous studies have highlighted that wastage is often multifactorial, influenced by systemic, technical, and procedural shortcomings (12). One of the most frequently reported contributors is improper inventory management, which includes overstocking, poor forecasting of blood demand, and failure to apply the First-In-First-Out (FIFO) principle during storage. Such practices lead to the expiration of blood products, a major source of wastage, particularly for components like platelets that have a short shelf life of 5–7 days (25-27). When these components are not used in time, they must be discarded, regardless of their quality.

Storage-related issues also significantly contribute to blood wastage. Blood components must be stored within precise temperature ranges, and deviations whether due to power outages, malfunctioning equipment, or human error can compromise their viability (28). In addition, inaccurate collection volumes, such as underweight or overweight blood bags, do not use calibrated volume-measuring tools and improper donor screening in field collection (29).

Gray zone test results where laboratory findings are uncertain or ambiguous, often require precautionary discarding of units so as to minimize the risk of contributing to wastage. The breakdown of red blood cells, rendering blood units unsuitable for use is caused by Hemolysis, triggered by physical trauma, improper storage, or extended storage durations (21, 30). Similarly, clot formation due to improper mixing during collection, and lipemia, which is characterized by high lipid content in plasma, can interfere with laboratory analysis and component separation processes (27).

More issues unfold as a result of the lack of pediatric blood bags in facilities where small-volume transfusions are common. In such cases, using standard-sized units can lead to partial usage and wastage of the remaining blood (31). In addition, bag leakage which is caused by manufacturing

flaws or rough handling during transport and storage, may affect the integrity and safety of blood products (9).

Another major factor that causes blood wastage is communication issues within healthcare institutions. Poor coordination between blood banks and clinical departments, such as miscommunication about patient needs, delays in transfusion orders, or last-minute surgical cancellations can cause blood to be unnecessarily patterned and retained longer than needed, and eventually reaching its expiration (32). Inadequate transportation systems further worsen this problem by increasing the risk of exposure to unsuitable temperatures or conditions during distribution.

Human errors and administrative lapses remain critical contributors. These include incorrect documentation and non-compliance with standard operating procedures during collection, processing, and transfusion. Donor-related factors, such as seropositivity for transfusion-transmissible infections (TTIs), also lead to the inevitable discard of blood units (33).

Institutional and systemic variables, such as the presence or absence of quality assurance mechanisms, staff competency, and adherence to national or international blood safety standards, play a substantial role in determining wastage rates. Interventions aimed at minimizing wastage must therefore be multifaceted, involving improved training, efficient communication, investment in infrastructure, and the consistent application of evidence-based blood utilization protocols (27).

2.3 Conceptual framework of the study

The conceptual framework will look at the factors that influence the wastage of blood in the area of this study. The dependent variable is the blood wastage rate and the independent variables are its associated factors Passed Expiry date, Reactive for TTIs, Storage problem, Incorrect Collection volume (underweight and overweight), Lipemic blood, Gray Zone test results, Cell contamination, Hemolysis, Blood Clot, Blood bag leakage, Quality controls issues and Absence of pediatric blood bag. By mapping these relationships, this framework emphasizes the critical role of effective blood management practices to minimize wastage and ensure a stable blood supply for patients in need (Figure 1).

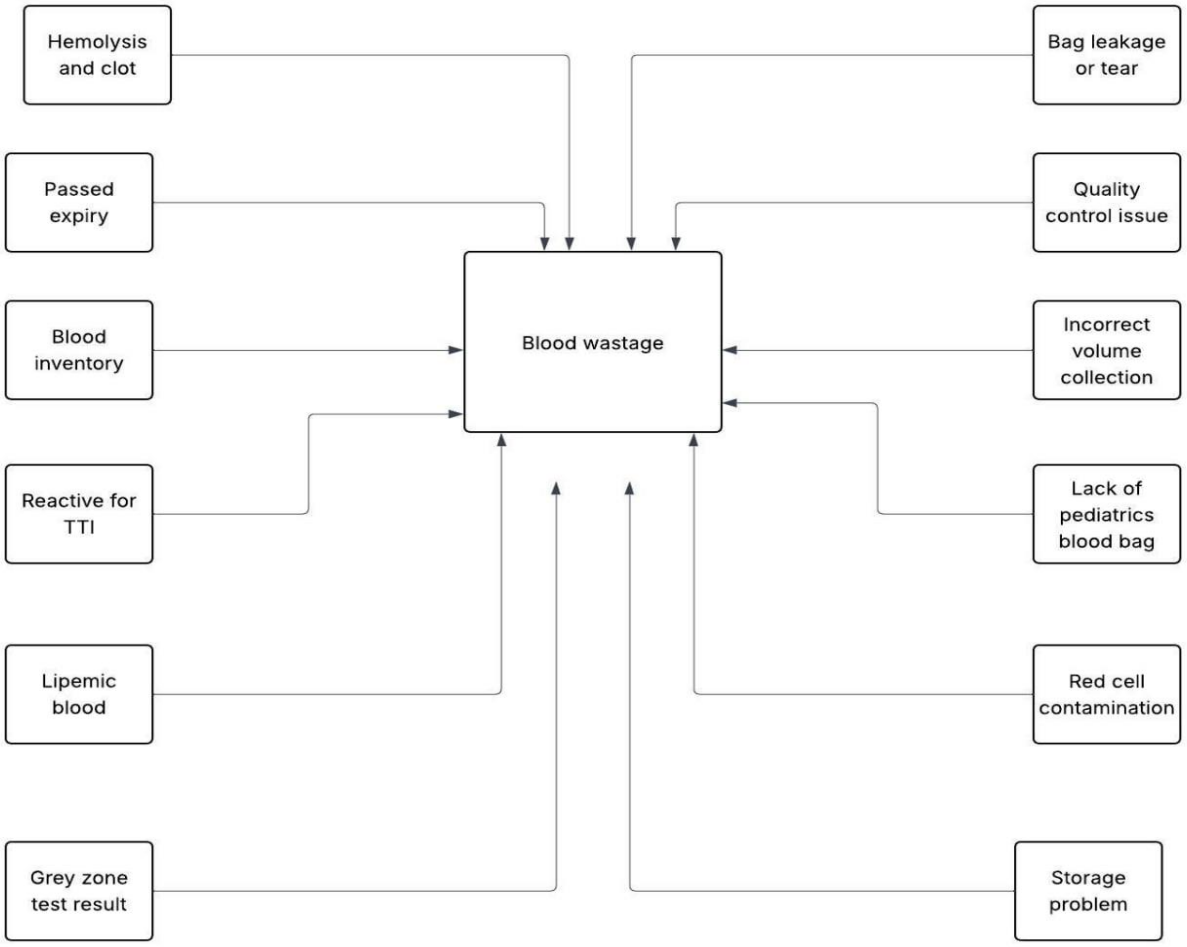

Figure 1: Conceptual Framework

3. Objectives

3.1 General Objective:

- To assess blood and blood component wastage rate and associated factors at EBTBS and selected hospitals in Addis Ababa, Ethiopia, 2024/2025.

3.2 Specific Objectives:

- To analyze the wastage rate of blood and blood components in EBTBS Addis Ababa, Ethiopia.
- To analyze the wastage rate of blood and blood components in selected hospitals in Addis Ababa, Ethiopia.
- To assess factors associated with the rate of blood and blood component wastage in EBTBS and selected hospitals in Addis Ababa, Ethiopia.

4. Method and materials

4.1 Study area

The study was conducted in three selected facilities. EBTBS was the first study area. It is located in Lideta Sub-City, Addis Ababa. Established by the Ethiopian Red Cross Society in 1969, it is the largest and oldest blood bank in Ethiopia, serving as a central hub for blood collection, processing, testing, storage, and distribution across Ethiopia. It plays a major role in national blood policy implementation, quality assurance and the management of blood supply chains (34). The second study area was TASH, established in 1964, it serves as a major teaching hospital affiliated with the School of Medicine at Addis Ababa University. The hospital provides a wide range of specialized clinical services and is a key training center for medical students and health professionals from Ethiopia and other African nations which also handles the highest patient volume in the country. It is also a leading center for complex surgical interventions, oncology, emergency medicine, and trauma care (35). All of which are high blood-utilization departments, it was included in the study because it provides a representative picture of public sector demand and clinical practices. The third study area was MCM Comprehensive Specialized Hospital which is a private hospital located in Bole Sub-City, Addis Ababa. It was founded by Myungsung Presbyterian Church of South Korea in 2004 to provide quality health care to Ethiopians and to train Ethiopian medical professionals, which performs many kinds of surgeries (36).It is included in the study to capture perspectives and practices from the private health sector.

4.2 Study Design and Period

A facility-based prospective and retrospective cross-sectional study was conducted to assess blood and blood component wastage rate and associated factors in EBTBS and Selected Hospitals from November 2024 to April 2025.

4.3 Population

4.3.1 Source Population

The source population was all blood units collected, processed, and stored by EBTBS, as well as all blood units received at selected hospitals and also all health professionals who were working in EBTBS and selected hospitals.

4.3.2 Study Population

The study population was blood units directly handled during the study period and fully documented at EBTBS and selected hospitals, and also health professionals who manage blood units (laboratory personnel, transfusion nurses, and quality assurance staff).

4.4 Sample Size

The study includes a total of three facilities: one blood center, one public hospital, and one private hospital with a total of 84,501 issued blood units: 75,881 units from EBTBS, 7,258 units from TASH and 1,362 units from MCMH. A total of 105 Health professionals who manage blood and blood components (Laboratory professionals, Nurses); 60 from EBTBS, 30 from TASH, and 15 from MCM Comprehensive Specialized Hospital were included in the study. For the qualitative study, 3 key personnel were included for interview, one from each study areas.

4.5 Sampling technique

The purposive sampling method was used for both quantitative and qualitative study.Three facilities were selected; the first one was EBTBS. The rationale behind the selection was its central role in blood collection, processing, and distribution. The second and the third facilities were one from a public and the other from a private hospital selected by considering their blood utilization. For the quantitative study to allocate questionnaires, the purposive sampling method is used to select health professionals who directly handle blood. For the qualitative study blood bank managers were selected from each facility.

4.6 Inclusion and Exclusion Criteria

4.6.1 Inclusion criteria

- Blood Unit Records within the study period that are fully documented
- Health professionals who are directly engaged in blood management

4.6.2 Exclusion criteria

- Blood Units with incomplete or missing data

4.7 Study Variables

4.7.1 Dependent Variables

- Blood and Blood Component Wastage Rate

4.7.2 Independent Variables

- Socio-demographic data (Age, Sex, Gender….)
- Expired shelf life
- Transfusion-Transmitted Infection (TTI) positivity
- Improper storage conditions
- Incorrect collection volume
- Lipemic blood
- Gray zone test result
- Blood bag leakage
- Quality control issues
- Blood Inventory Management
- Red cell contamination
- Hemolysis
- Blood Clot
- Lack of pediatric blood bag

4.8 Data collection procedure

4.8.1 Data collection tool

Data was collected using a structured checklist adopted from (blood bank and hospitals assessment checklist prepared by the Federal Democratic Republic of Ministry of Health), questionnaire, and in-depth interview. For quantitative data, blood unit wastage was analyzed from data taken physically during data collection and was calculated. For qualitative data, in-depth interviews, audio recorders, and field notebooks were used. Blood bank managers who engaged in blood management and have experience were interviewed.

4.8.2 Data collection procedure

Data was collected by the principal investigator. Retrospective and prospective data of blood and blood component wastages and their potential cause were collected by using a structured checklist. Associated factors were assessed by using a structured questionnaire, and qualitative data were collected by conducting key informant interviews.

4.9 Data Quality Assurance

The questionnaire was pretested on 10% of the professionals in St. Paul's Hospital Millennium Medical College to ensure the validity of the tool and clarity and easy understandability for each respondent. After analyzing the pre-tested results, the refined questionnaire was used to collect the actual data. Double data entry was employed to enhance the reliability of collected data.

4.10 Data Analysis and Interpretation

The blood and blood component wastage rate was calculated during a period of six months in EBTBS and selected hospitals. Using the formula:

$$\text{Blood Wastage Rate: Blood Wastage Rate (\%)} = \frac{\text{Number of units wasted}}{\text{Total number of blood collected (issued)}} \times 100$$

Data from the questionnaire were entered and then analyzed using SPSS version-26 software. The analyzed data were presented using descriptive statistics such as percentages, frequency distribution, and appropriate graphs. Further, a bivariate and multivariate logistic regression analysis was performed to investigate the relationship between dependent and independent variables. All variables with a p-value of ≤ 0.2 in bivariate analysis were included in the multivariate logistic regression. The strength of association was measured using the odds ratio, 95% confidence interval, and a p-value ≤ 0.05 was considered statistically significant. The results were presented in the form of Adjusted Odds Ratio (AOR) and 95% Confidence Interval (CI).

The analysis of qualitative data was analyzed and summarized thematically, and relevant quotations were used to illustrate themes in the presentation of the study findings using narrative approaches.

4.11 Operational Definitions

These operational definitions are developed based on my understanding and interpretation of the terms relevant to the study's objectives.

- Blood Components: Separated parts of whole blood, including red blood cells, plasma, and platelets, that can be used individually for specific medical treatments.
- Blood Wastage: The proportion of blood and its components that are discarded due to expiration, contamination, improper storage, or any other reason that makes the blood unsuitable for transfusion.
- Expiration: The end of the allowable storage period for blood or its components, after which it is deemed unfit for use.
- Contamination**:** Any blood unit that is deemed unusable due to microbial or cell contamination during processing, storage, or handling.
- Transfusion Adequacy: The availability of sufficient and safe blood units to meet the transfusion needs of patients in a given health facility.
- Supply Chain Efficiency: The effectiveness of the processes involved in predicting demand, distributing blood, and preventing wastage due to delays in transport or distribution.

4.12 Ethical Consideration

The research was conducted after an Ethical clearance letter was obtained from the research and ethics review committee at Addis Ababa University, College of Health Science, Department of Medical Laboratory Sciences. Then officials and responsible bodies working in the study areas were communicated through letters before the data collection process. The purpose of the study was explained, and informed consent was given to each study subject prior to the interview and questionnaire. To ensure confidentiality, all study participants' results and information were kept confidential, and personal identifiers were removed and analyzed anonymously. Participation in the study was voluntary.

4.13 Dissemination of Results

After conducting the research, the results of the study will be submitted to the School of Medical Laboratory Sciences in two hard copies and a soft copy on a CD. Moreover, the hard copy of the results will also be given to the national blood bank and other stakeholders. The results of the study will be submitted to peer-reviewed journals for publication. The findings will also be communicated through presentations at scientific conferences.

5. Result

5.1 Blood and Blood components collection and wastage in EBTBS

Blood wastage rate refers to the proportion of blood and/or blood components that are discarded or deemed unusable compared to the total number of units available (collected or issued) over a specific period. A total of 48,235 units of blood were collected in EBTBS in the study period. Of the total blood units, 31,444 were preserved as whole blood (WB), while the remaining 16,791 were processed into components such as 16,207 packed red cells (PRBC), 14,115 platelet concentrate (PC), and 14,115 fresh frozen plasma (FFP). The total number of blood units issued during the study period was 75,881.

The total blood wastage rate was 7,738 (10.15%) with 8,298,866.68 ETB from November 2024 to April 2025, as shown in Figure 2. The highest wastage was observed in Fresh Frozen Plasma (FFP) 3,456 (4.5) units discarded, followed by Whole Blood 2,812 (3.7%), Platelet Concentrate (PC) 1,007 (1.3%), and Packed Red Blood Cells (PRBC) 463 (0.61%) (Figure 2).

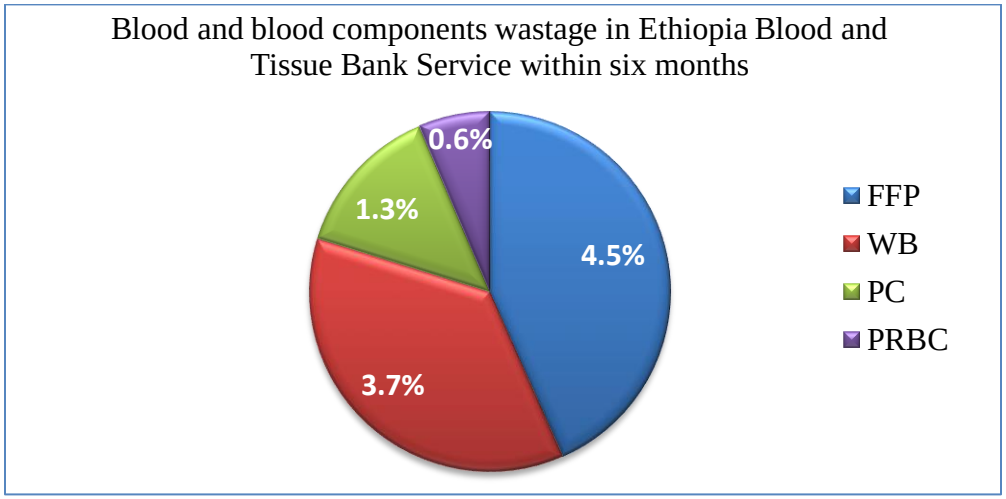

Figure 2: Distribution of blood wastage rate in EBTBS

Among the causes of blood wastage, Inaccurate volume collection 4,271 (55%) was the most common cause of blood and blood component wastage, followed by TTIs 1,903 (24.5%), storage issues 741 (9.57%), and item expiry dates 302 (3.9%) (Table 1).

Table 1: Distribution of wasted blood units according to causes in EBTBS

Causes of blood wastage	Whole Blood	Packed Red Blood Cells	Platelet Concentrate	Fresh Frozen Plasma	Total unit discarded
Expiry	14 (0.49%)	3 (0.6%)	279 (27.7%)	6 (0.17%)	302 (3.9%)
TTIs	703 (25%)	378 (81.6%)	411 (40.8%)	411 (11.89%)	1,903 (24.5%)
Inaccurate blood volume collection	2,002(71%)	17(3.67%)	80(7.95%)	2,172(62.8%)	4,271(55%)
Lipemia	1 (0.035%)	0 (0%)	92 (9%)	34 (0.98%)	127 (1.64%)
Gray Zone	59 (2%)	48 (10%)	46 (4.5%)	36 (1%)	189 (2.44%)
RBC contamination	0 (0%)	0 (0%)	10 (0.99%)	5 (0.14%)	15 (0.19%)
Quality Control units	0 (0%)	5 (1%)	22 (2.18%)	9 (0.26%)	36 (0.46%)
Storage problem	1 (0.035%)	1 (0.2%)	7 (0.69%)	732 (21%)	741 (9.57%)
Bag tear/leakage	32 (1.1%)	11 (2.37%)	60 (5.95%)	51 (1.47%)	154 (1.99%)
Total	2,812(36.35%)	463(6.0%)	1,007(13.0%)	3,456(44.7%)	7,738 (100%)

5.2 Blood and Blood components received and wasted in selected hospitals

A total of 8,620 blood units were received by TASH and MCM Comprehensive Specialized Hospital. Of the total of blood units received; 1,556 were whole blood, 3,140 PRBC, 2,499 PC, and 1,425 FFP.

The total blood wastage rate at TASH and MCM Comprehensive Specialized Hospital was 229(2.6%) with 245,638.24 ETB from November 2024 to April 2025. As shown in Figure 4. The highest wastage was observed in Whole Blood (WB) 93(1%) followed by Fresh Frozen Plasma (FFP) 66(0.7%), Packed Red Blood Cells (PRBC) 40(0.46%), and Platelet Concentrate (PC) 30(0.34%) (Figure 4).

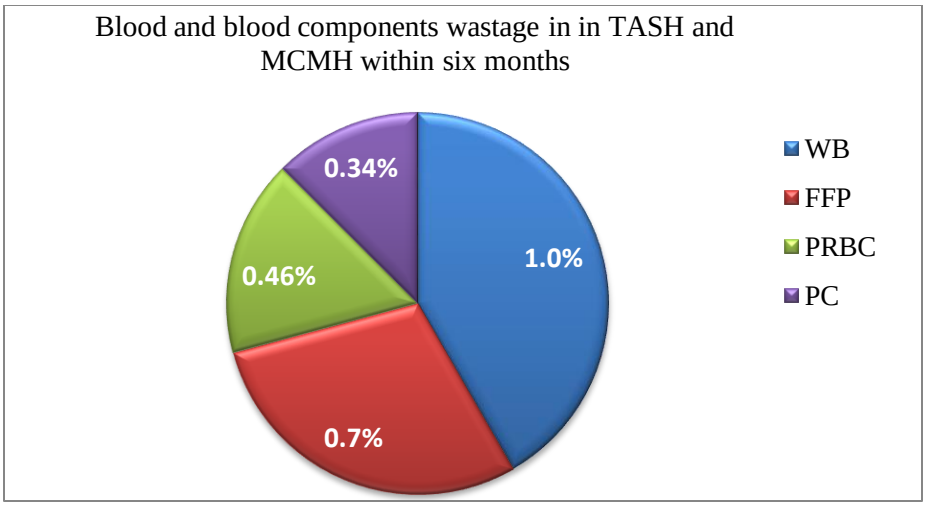

Figure 3: Distribution of blood wastage rate in hospitals

Among the whole blood highest cause of wastage is expiration 72 (77.4%) followed by storage problems 16 (17.2%). Similarly, in the case of PRBC expiration date 26 (65%), leakage 8 (20%), and Storage problem 8 (20%). In the case of platelets, Expiration date 14 (46.6%), and RBC contamination 10 (33.3%) were the predominant causes. However, in FFP expird date 118 (51.5%), and Storage problems 50 (21.8%) were the main causes (Table 2).

Table 2: Distribution of Wasted blood Units According to Causes in hospitals

Causes of blood wastage	**Whole Blood**	**Packed Red Blood Cells**	**Platelet Concentrate**	**Fresh Frozen Plasma**	**Total unit discarded**
Expiry	72 (77.4%)	26 (65%)	14 (46.6%)	6 (9%)	118 (51.5%)
RBC contamination	0 (0%)	0 (0%)	10 (33.3%)	7 (10.6%)	17 (7.4%)
Storage problem	16 (17.2%)	6 (15%)	2 (6.6%)	26 (39.4%)	50 (21.8%)
Bag tear/leakage	5 (5.3%)	8 (20%)	4 (13.3%)	27 (40.9%)	44 (19.2%)
Total	93 (40.61%)	40 (17.47%)	30 (13.10%)	66 (28.82%)	229 (100%)

The total cost incurred due to the wastage of blood and blood components was 8544505.52 ETB (Table 3).

Table 3: The cost of blood units wasted at EBTBS and selected hospitals(cost of 7,967 units of blood)

Cost Category	Unit Cost (ETB)	Total Units	Total Cost (ETB)	T. cost in %
Labor Cost	62.70	7,967	499,556.90	5.85%
Collection Materials	164.86	7,967	1,313,833.62	15.38%
Testing Reagents	770.00	7,967	6,133,590.00	71.78%
Post-Donation Consumables	75.00	7,967	597,525.00	6.99%
Total			**8,544,505.52**	**100%**

5.3 Blood wastage due to the lack of pediatric blood bag

A total of 249 pediatric patients were admitted and received transfusions of either whole blood or packed red blood cells (PRBC) during the study period (Figure 6). Their ages ranged from 2 months to 13 years. In total, 91 units of whole blood, equivalent to 31,850 milliliters, were utilized. Of this amount, 18,110 milliliters were transfused to patients, while 13,740 milliliters were discarded. Similarly, 158 units of PRBC were collected, corresponding to 71,100 milliliters. Out of this, 37,575 milliliters were transfused, and 33,525 milliliters were discarded.

Calculated as: 1 unit of whole blood= 350ml 1 unit of PRBC= 450ml

91 unit of whole blood= 91× 350ml= 31,850ml 158 unit of PRBC= 158 × 450ml= 71,100ml

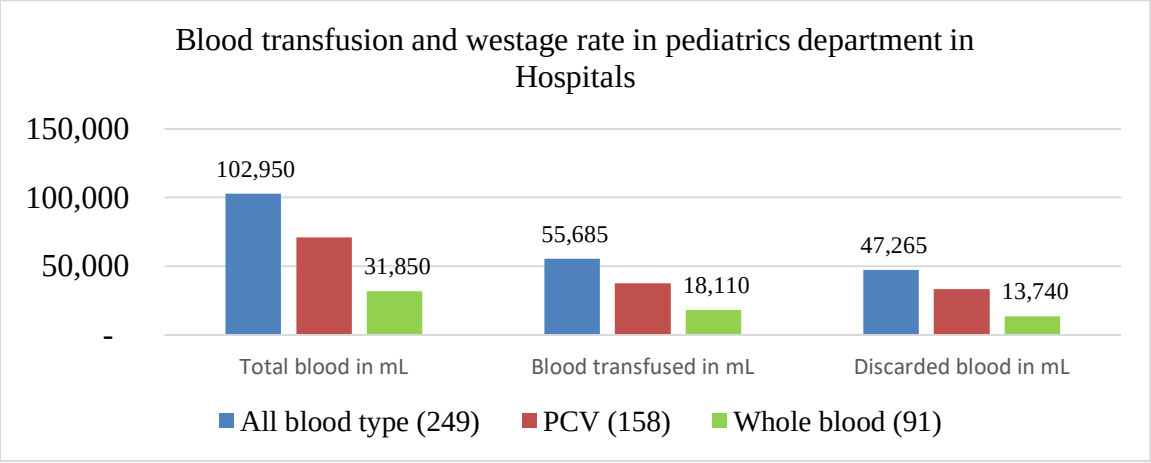

Figure 4: Blood transfusion and wastage in the pediatrics department in the hospital

5.4 Associated factors of Blood and blood component wastage

Binary and Multiple Logistic Regression Analysis

All variables were pooled in to bivariate logistic regression and those variables that were significant in bivariate were pooled into multivariate logistic regressions with 95% CI, blood is 8 times more likely to be discarded due to expiry, blood is 4.6 times more likely to be discarded due to TTI reactivity, Improper storage increases the odds of discard by approximately 8 times, Incorrect collection volume increases odds of discard by 11.7 times, Absence of pediatric blood bags leads to a nearly 10-fold increase in discard. In contrast, blood inventory management is not statistically significant it indicating potential protective effect, but inconclusive (Table5).

Table 4: Binary and multiple logistic regression analysis of the associated factor of blood and component wastage at EBTBS and selected hospitals

Variable	Category	Blood not wasted	Blood wasted	COR (95% CI)	P-Value	AOR (95% CI)	P-Value
Expiry date	No	35 (33.3%)	10 (9.52%)	5.5(2.366, 12.785)	<0.001	8.06 (2.020,32.17)	0.029
	Yes	20 (19%)	40 (38%)	1		1	
TTIs	No	34 (32.4%)	11 (10.5%)	7.0(2.891,16.949)	<0.001	4.6 (1.169,18.096)	0.003
	Yes	14 (13.3%)	46 (43.8%)	1		1	
Improper storage	No	36 (34.3%)	9 (8.57%)	12.0(4.709,30.579)	<0.001	8.08 (2.224, 29.4)	0.002
	Yes	15 (14.3%)	45 (42.85%)	1		1	
Inaccurate blood volume collection	No	30 (28.57%)	15 (14.3%)	10.1(4.106,25.120)	<0.001	11.7 (2.963,45.99)	<0.001
	Yes	16 (15.2%)	44 (41.9%)	1		1	
Lipemia	No	25 (23.8%)	20 (19%)	1.33 (0.615,2.9)	0.464	---	---
	Yes	29 (27.6%)	31 (29.5%)	1		---	---
Gray-Zone test result	No	17 (16.1%)	28 (26.6%)	0.91(0.4,1.2)	0.817	---	---
	Yes	24 (22.8%)	36 (34.2%)	1		---	---
Bag leakage	No	9 (8.5%)	36 (34.2%)	1.25(0.46,3.3)	0.661	---	---
	Yes	10 (9.5%)	50 (47.6%)	1		---	---
Quality control issue	No	19 (18%)	26 (24.7%)	0.68(0.31,1.48)	0.338	---	---
	Yes	31 (29.5%)	29 (27.6%)	1		---	---
Lack of pediatric blood bag	No	30(28.57%)	15 (14.3%)	4.0(1.762, 9.081)	0.001	10 (2.288, 43.057)	0.002
	Yes	20 (19%)	40 (38%)	1		1	
Blood inventory management	No	21 (20%)	24 (22.8%)	0.6(0.182, 9.02)	0.027	0.5 (0.132, 2.626)	0.486
	Yes	41 (39%)	19 (18%)	1		1	---
Hemolysis	No	29 (27.6%)	16 (15.2%)	0.77(0.34,1.76)	0.548	---	---
	Yes	42 (40%)	18 (17.1%)	1		---	---
Blood Clot	No	16 (15.2%)	29 (27.6%)	1.2(0.56,2.9)	0.565	---	---
	Yes	18 (17.1%)	42 (40%)	1		---	---

5.5 Comprehensive Analysis of Key Informant Interview Findings

The key informant interviews provided critical qualitative insights that complemented and enriched the quantitative survey data, revealing systemic operational challenges associated with blood wastage across Addis Ababa's blood service facilities. Conducted with experienced managers from EBTBS, TASH, and MCM Comprehensive Specialized Hospital ten years, seven years, and one year experience in a blood bank respectively, these interviews explored several themes including causes of blood wastage, inventory management practices, common components wasted, frequency of expiry, coordination with suppliers, and recommendations for improvement. The interview was conducted in Amharic; Thematic Analysis was used, translated into English, interpreted for meaning, and narrated as presented as English

5.5.1 Causes of blood and blood component wastage

Across the three facilities, a variety of operational and systemic factors were identified as causes of blood and blood component wastage.

"Sometimes outdoor blood collection (Mobile-team) donors are not properly screened and feainting can happen; at that time, underweight blood is collected. In addition, there is a lack of instruments that measure blood volume, leading to overweight and underweight blood collection, which causes blood discarded. Also we don't have of fully automated centrifuge because of that cell contamination of platelet and Fresh Frozen Plasma (FFP) can happen. We have also discard blood units reactive to Transfusion-Transmissible Infections (TTIs) we couldn't perform strategic mapping of high-risk collection zones. We discarded Gray zone test results samples near the reactive cutoff value by considering the potential window period of infections. Furthermore lipemic blood was also discarded because we don't have a standard operating procedure for decision-making. 1% of the total prepared blood is used for quality control tests and the remaining amount is discarded. Other causes include, laboratory accidents such as bag damage during centrifugation. We have no pediatric blood bag currently, we used to purchase and prepare blood for pilot test but the hospitals were not aware and they didn't t request at that time many blood expired." (Distribution Officer at, EBTBS)

"Blood units were sometimes taken to wards by physicians and nurses from the laboratory later returned after being exposed to room temperature for a long period of time. Other prominent causes are bag linkage during FFP thawing at water baths and absence of pediatric blood bags." (Blood bank manager of TASH)

"Breakdowns in First-In, First-Out (FIFO) and First-Expired, First-Out (FEFO) practices. We don't have an agitator machine for platelet storage this is also another factor. Requisite cancellations after thawing FFP, communication gaps between physicians and lab personnel further contributed to wastage." (Blood bank manager of MCM Specialized Comprehensive Hospital)

5.5.2 Inventory Management Practices

Inventory management systems varied across the institutions.

"We use an electronic blood safety information system (BSIS) to manage in-stock and in-process blood." (Distribution Officer, EBTBS)

"We use a manual inventory management system, applying FIFO and FEFO." (Blood bank manager of TASH)

"We use a bin card system to monitor stock levels and patient flow trends." (Blood bank manager of MCM Specialized Comprehensive Hospital)

5.5.3 Frequently Wasted Blood Components

"*Fresh Frozen Plasma (FFP) is the most frequently wasted blood component because of low demand"* (Distribution Officer, EBTBS)

"Fresh Frozen Plasma (FFP) is the most frequently wasted blood component because sometimes there is cell contamination and blood bag damage during thawing" (Blood bank manager of TASH)

"Fresh Frozen Plasma (FFP) is the most frequently wasted blood component because of blood bag damage during thawing, low demand and physician request cancellations." (Blood bank manager of MCM Specialized Comphernsive Hospital).

5.5.4 Frequency and Trends of Blood Wastage

The facilities have experienced regular instances of discarded or expired blood.

"Health centeres that don't have much demand return near-expired blood units at that time wastage happens." (Distribution Officer, EBTBS)

"We encounter discards within one to two weeks" (Blood bank manager of TASH)

"We encounter discards within a month especially for less common blood groups like AB positive." (Blood bank manager of MCM Specialized Comprehensive Hospital)

5.5.5 Challenges in Inventory Management

We do have resource shortages, both in terms of equipment and human resource." (Distribution Officer, EBTBS)

"We don't have a digital blood stock tracking system and there is a communication gap with the physicians" (Blood bank manager of Blacklion Specialized Hospital)

"We don't have sufficient training for blood bank staff especially the newly joined staff ." (Blood bank manager of MCM Specialized Comprehensive Hospital)

5.5.6 Coordination between Hospitals and EBTBS

Efforts to improve coordination were noted

"We give onsite training, supervision visits, and maintaining contact with assigned focal persons in hospital mini-blood banks." (Distribution Officer, EBTBS)

"There is a supply mismatches such as receiving whole blood instead of Packed Red Cells led to the expiration of unused components." (Blood bank manager of MCM Specialized Comphernsive Hospital)

5.5.7 Recommendations for Reducing Blood Wastage

All three facilities offered suggestions to reduce wastage.

"We are currently doing a root cause analysis and have set a target to reduce wastage to an acceptable level of 4%. We also plan to survey the demand for FFP and export excess plasma for fractionation into medicinal products (e.g., Albumin, Factor VIII)." (Distribution Officer, EBTBS)

"We need to digitize inventory management, provide regular training for blood bank personnel investing in pediatric blood bags. (Blood bank manager of Blacklion Specialized Hospital)

"We have to improve communication between lab staff and physicians and strengthening inventory practices." (Blood bank manager of MCM Specialized Comprehensive Hospital)

5.5.8 Summary of Key Informant Interview Insights

The key informant interviews brought depth and context to the numbers, giving more emphasis on the real challenges behind blood wastage in Addis Ababa's healthcare facilities. While resource constraints and outdated systems contribute to inefficiencies, moreover the everyday struggles of staff became evident—gaps in training, miscommunication, and a lack of clear protocols are also issues that need to be considered. Additionally, Poor coordination between hospitals and blood banks, improper storage practices, and the absence of standardized operating procedures also play a role in avoidable losses.

But on the good side, there is hope. Addressing these issues requires more than just policy shifts; it needs practical solutions that empower healthcare workers. By analyzing the main associated factors and implementing targeted training programs, upgrading technology, and fostering stronger collaboration between hospitals and blood banks, we can significantly lower wastage. Also ensure that every unit of blood serves its intended purpose, potentially saving countless lives.

6. Discussion

This study attempts to analyze the blood wastage rate and associated factors from November 2024 to April 2025 at EBTBS and selected hospitals using both quantitative and qualitative study approaches. In the study period, a total of 48,235 units of blood were collected in EBTBS of the total blood units 31,444 were Whole Blood (WB), and the remaining 16,791 were made into components like 16,207 Packed Red Cells (PRBC), 14,115 Platelet Concentrate (PC) and 14,115 Fresh Frozen Plasma (FFP). The total blood units issued during the study period were 75,881. A total of 8,620 units of blood were received by TASH and MCM Comprehensive Specialized Hospital total blood units received; 1,556 were whole blood, 3,140 PRBC, 2,499 PC, and 1,425 FFP.

The total blood wastage rate was 7,738 (10.15%) and 229 units (2.6%) with 8,544,505.52 ETB from November 2024 to April 2025 at EBTBS and hospitals respectively. These rates are higher than discard levels reported from Iran (9.8%) and much higher than some studies in India where discard rates were reported as low as 1.49% (22, 33). The central blood bank, due to having more complex tasks like screening, separation, and distribution has a higher discard rate relative to smaller facilities. This signals the need for efficient handling and storage practices at processing centers.

Fresh Frozen Plasma (FFP) has been observed to have the highest wastage, with a discard rate of 3,355 (4.4%) units, followed by Whole Blood 2,812 (3.7%), Platelet Concentrate (PC) 1,075 (1.4%), and Packed Red Blood Cells (PRBC) 496 (0.65%). We can say that the higher discard of FFP might be influenced by the short post-thaw shelf life and limited clinical demand for multiple-unit plasma transfusion (37). FFP requires it to be used within a short time frame after thawing otherwise it can lead to being discarded, and it also needs controlled thawing. This finding demonstrates the importance of better demand forecasting for plasma components.

Hospital data shows that the highest wastage was observed in Whole Blood (WB) 93(1%) followed by Fresh Frozen Plasma (FFP) 66(0.7%), Packed Red Blood Cells (PRBC) 40(0.46%), and Platelet Concentrate (PC) 30(0.34%).

Inaccurate blood volume collection not only wastes the donation but also consumes costly reagents and processing time; this was the case at EBTBS, where the leading cause of wastage was inaccurate collection volume (55%), highlighting the challenges faced at field donation campaigns lacking calibrated volume-measuring tools and improper screening. Assistance on collection monitoring tools and better training for mobile blood collection teams is critical to addressing this challenge (29).

Reactivity to transfusion-transmitted infections (24.5%) was another major contributor, consistent with findings in other countries where infections like HIV hepatitis B and C were responsible for large proportions of discards (22). This suggests that enhancing pre-donation screening procedures and mapping high-risk areas could substantially reduce loss due to TTI-reactive units (11).

Additional causes included expiry, lipemia, broken or leaking bags, and storage issues, particularly when blood was returned from hospitals close to expiry and could not be reissued. These avoidable causes point to systemic issues in transport, handling, and storage protocols, particularly during returns from clinical departments. Reinforcing cold chain integrity is essential (3).

A rarely reported issue was the discard of pediatric transfusion units caused by the lack of pediatric blood bags. This is an issue that is crucial due to its targeting a critical patient group with having short supply (31). This issue being addressed would significantly reduce overall losses and, moreover, improve pediatric transfusion outcomes since 13,740 ml of WB and 33,525 ml of PRBCs are known to be discarded after partial use.

Five key factors identified as strongly associated with blood and component wastage have pointed toward clinical and operational gaps. Gaps that require an integrated approach for combining quality control, protocol enforcement, and policy support to fill the gaps exposed to TTIs, inaccurate collection volume, improper storage, expiry, and lack of pediatric blood bags. The above-mentioned challenges are found to be similar in documented regional studies, reinforcing the need for a strong governance framework and routine internal audits within blood banks and transfusing hospitals to solve the gaps in processing, infrastructure, and clinical-lab coordination that lead to preventable losses. Strengthening equipment availability and updating procedural standards are keys to reducing technical errors in blood processing and issues (38). Operational

gaps were identified, and the absence of automated tools and frequent returns of near-expiry units from hospitals were highlighted by EBTBS personnel.

Outdated manual inventory logs, inadequate cold-chain preservation during returns, and weak communication between wards and blood banks are the logistical obstacles that restrain efficient blood usage. This has been done by the Hospital staff. All of these challenges stress the need for better coordination protocols in order to improve blood management. In order to avoid having a significant amount of collected blood continue to go unused we need to improve field equipment, and having a targeted intervention, such as ensuring the availability of pediatric blood bags, enhancing donor screening, upgrading inventory systems, and providing comprehensive staff training. These improvements will result in the collected blood reaching the patients who need it most. Encouragingly, success stories from Hong Kong and the United Kingdom illustrate how standardized transfusion protocols and well-coordinated supply chains can dramatically lower blood discard rates (39). These examples tell us that if institutional policies are applied properly, they can lead to significant reductions in wastage.

In summary, some level of blood discard is unavoidable, but most of the wastage observed in this study is preventable through operational improvements, infrastructure investments, and stronger clinical collaboration. These findings show that Hospitals, policymakers, and staff need to act quickly to fix problems in the blood supply system. Every step must work better so that donated blood is not wasted and reaches the patients who need it.

7. Strength and Limitation

I couldn't calculate the intrinsic cost of the blood itself while calculating collection, processing, labor, and donor consumable costs, and the study is restricted to two hospitals and may not be generalizable according to the hospital's blood wastage rate. However, it comprehensively addresses a gap in the study on blood and blood component wastage in both collection centers and hospitals in national wide.

8. Conclusion and Recommendation

8.1 Conclusion

The current study demonstrated that the blood and blood component wastage rate was 9.8% and 2.65% with a cost of 8,544,505.52 ETB from November 2024 to April 2025 at EBTBS and selected hospitals respectively. Among the components, fresh frozen plasma shows a high wastage rate. Passed expiry date, transfusion-transmitted infections, improper storage conditions, Inaccurate blood collection volume, and lack of pediatric blood bag show a significant association with blood wastage rate. A significant and rarely reported issue was the discard of pediatric transfusion units. In the absence of pediatric blood bags, blood is utilized partially and the remaining amount is discarded. This wastage is particularly concerning as pediatric units represent a critical patient group, and blood products are often in short supply. Addressing this issue could significantly improve pediatric transfusion outcomes and reduce overall losses.

8.2 Recommendation

- Hospitals need proper documentation and have to establish regular audits of blood usage and wastage, and provide feedback to departments to identify trends and promote accountability.
- Adopt Pedi packs and split components for neonates and pediatric patients to prevent underutilization and discard of unused blood.
- Conduct periodic training on the storage, handling, and transportation of blood to minimize human errors leading to spoilage or contamination.

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Annex

Annex I – Subject Information Sheet

Study Title: Blood and Blood Component Wastage Rate: Associated Factors in Ethiopia Blood and Tissue Bank Service and Selected Hospitals Addis Ababa, Ethiopia.

Principal Investigator: Saron Tamire (BSc), Addis Ababa University, Tsaron27@gmail.com, +251960627661

Purpose of the Study:

This study aims to identify Blood and Blood Component Wastage Rate: Associated Factors in Ethiopia Blood and Tissue Bank Service and selected hospitals, such as Tikur Anbessa Specialized Hospital and MCM Comprehensive Specialized Hospital. The findings will help to improve blood management practices and ensure better availability of blood for transfusions.

What Does Participation Involve?

- For healthcare professionals: You may be asked to complete a short survey about your role in blood management practices.
- For retrospective data: Records of blood units from November 2024 to January 2025 will be reviewed for wastage trends.
-
- Participation is entirely voluntary, and you may choose to withdraw at any time without penalty.

Duration of Participation:

- For prospective data collection, participation will take approximately [duration, e.g., 20–30 minutes] for surveys.

Potential Risks and Benefits:

- Risks: There are no anticipated risks to participants. Confidentiality will be strictly maintained.
- Benefits: By contributing to this research, you will help identify solutions to minimize blood wastage, improving the overall efficiency of blood supply systems in Ethiopia.

Confidentiality:

All information collected will remain confidential and will be used only for research purposes. No identifiable information will be shared in any reports or publications. Data will be securely stored and accessed only by the research team.

Voluntary Participation:

Your participation is entirely voluntary. You have the right to decline or withdraw from the study at any point, without any consequences.

Contact Information:

If you have any questions or concerns about the study, please feel free to contact:

- Principal Investigator: Saron Tamire (BSc),
- Email**:** Tsaron27@gmail.com,
- Phone**:** +251960627661

For additional information, please contact the Department of Medical Laboratory Sciences, Addis Ababa University, and the Institutional Review Board (IRB) office:-

Tel: +2511911107099

P.O Box: 9086, Addis Ababa, Ethiopia

Agree to participate? Yes No

Annex II – Consent Form

Code Number**:** ----------

Name of Study Subject: ----------

I have been informed about the study titled ‘‘Wastage Rate: Associated Factors in Ethiopia Blood and Tissue Bank Service and Selected Hospitals, Addis Ababa, Ethiopia.’’ The purpose, procedures, and potential benefits of the study were explained to me in detail.

I understand that all information collected in this study will remain confidential and will only be used for research purposes. I have also been informed of my right to withhold information, decline participation, or withdraw from the study at any time without penalty or loss of any benefits I am entitled to.

With a full understanding of the above, I voluntarily consent to participate in the study.

Participant’s Signature/Fingerprint: ----------

Signature**:** ---------- Date: ----------

Name of Counselor**:** ----------

Signature: ---------- Date: ----------

Name of Investigator : Saron Tamire (BSc),

Email**:** Tsaron27@gmail.com,

Phone**:** +251960627661

For additional information, please contact the Department of Medical Laboratory Sciences, Addis Ababa University, and Institutional Review Board (IRB) office;

Tel: +2511911107099

P.O Box: 9086, Addis Ababa, Ethiopia

Annexes III:- Structured Checklist

General Information

Hospital/Facility Name ----------

Location ----------

Time Period of Review ----------

1. **Blood Unit Information**

Item	Details
Total number of blood units collected	
Total number of blood units discarded	

1 Causes for Blood Wastage

For each discarded unit, record the reason for wastage (tick all applicable factors):

Cause of Wastage	Number of Blood Units Affected	Percentage of Total Discarded Blood Units (%)
Expired shelf life		
Transfusion-Transmitted Infection (TTI) positive		
Improper storage conditions (e.g., broken cold chain)		
Incorrect collection volume (underweight or overweight)		
Lipemic (milky/fatty)		
gray zone		
Manufacturing defects of bag, damaged bags or tear during centrifugation		
Quality control issues		

Cell contamination		

3. Blood Component-Specific Wastage

Blood Component	Number of Units Discarded	Reason for Wastage
Whole Blood (WB)		
Packed Red Blood Cells (PRBCs)		
Platelet Concentrates (PC)		
Fresh Frozen Plasma (FFP)		

4. Discarded blood due to lack of pediatric blood bag

Blood Component Type	Amount of Blood the Bag Contains	Amount of Blood Transfused in Milliliter	The Remaining Discarded Blood in Milliliter
Whole Blood (WB)			
Packed Red Blood Cells (PRBCs)			
Platelet Concentrates (PC)			
Fresh Frozen Plasma (FFP)			

- **Additional Notes or Observations**

Observation	Details
Common trends	
Anomalies	
Recommendations	

Reviewer Information

Completed by (Name/Designation): _____

Date of Review: _____

Annexes IV:- Questionnaires

Dear respondents: -

My name is Saron Tamire, a postgraduate student at Addis Ababa University conducting a research study titled: “Blood and Blood Component Wastage Rate: Associated Factors in Ethiopia Blood and Tissue Bank Service and Selected Hospitals Addis Ababa, Ethiopia." This questionnaire is designed to collect essential data on the rate and associated factors of blood wastage in health facilities. Your honest and thoughtful responses are highly appreciated and will be kept strictly confidential. The data will be used only for academic purposes.

Thank you for your cooperation.

Contact: Tsaron27@gmail.com

General instruction:-

- No need to write your name.
- Please tick (√) the appropriate box.
- Sections include closed-ended (Likert scale) and open-ended questions.
- Estimated completion time: 15 minutes.

Thank you in advance, for your cooperation!

Part I – Background Information

1. Gender: Male ☐ Female ☐

2. Age: 18- 35 years ☐ 36- 45 years ☐ 46- 60 years ☐

3. Educational Level: Diploma ☐ First Degree ☐ MSC ☐ PHD ☐

4. Job Title/Position: Lab Technologist ☐ Blood Bank Manager ☐ Quality Manager Nurse ☐

5. Work experience: Below 2 years ☐ 3- 5 years ☐ 6- 10 years ☐ Above10years ☐

Part I –Blood and Component Wastage Rate

Please read each of the following questions carefully and respond by marking Yes or No based on what has occurred at your facility during the study period (November 2024 – April 2025). Tick (√) the box that best applies.

Question	YES	NO
Has blood or blood components ever been discarded without clinical use at this facility during the study period?		

Part II – Associated Factors of Blood and Component Wastage

Question	YES	NO
Is blood or blood components discarded in this facility due to expiry?		
Are blood and blood components frequently discarded due to TTI reactivity (HIV, HBV, HCV, Syphilis)?		
Are blood and blood components often wasted due to improper storage (e.g., power failure, temperature issues)?		
Does incorrect collection volumes (underweight/overweight) contribute to wastage?		
Are lipemic (milky/fatty) blood units discarded due to unsuitability for Transfusion?		
Are blood units wasted due to inconclusive or "gray zone" test results?		
Does improper handling or manufacturing defects in blood bag leakage contribute to wastage?		
Is blood discarded due to quality control issues unrelated to TTI screening?		
Does the Lack of pediatric blood bags result in the discarding of whole units intended for children?		
Has the facility a clear and consistently followed procedure for blood inventory management?		
Is blood hemolysis a reason for discarding blood units in your facility?		
Is clotting a common reason for rejecting or discarding blood in your facility?		

Annexes V:- Key Informant Interview Questions

1. From your experience, what are the primary causes of blood and blood component wastage in your facility?
2. Can you describe the procedures and systems your facility currently uses to manage blood inventory?
3. Which blood components are most frequently wasted, and what are the contributing factors in your opinion?
4. How often does your facility encounter expired or discarded blood units? Can you provide an estimate or trend over time?
5. What challenges does your facility face in implementing effective blood inventory management practices?
6. (For EBTBS staff): How does your facility coordinate with hospitals to improve inventory management and reduce wastage?
7. (For hospital staff): How do supply issues or delays from the EBTBS affect blood and component wastage in your facility?
8. What specific improvements or strategies would you suggest to reduce blood and blood component wastage at your facility or within the broader health system?