Volume 11, Issue 7, July – 2026 International Journal of Innovative Science and Research Technology
ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

Study on Analysis of Reasons for Discarding Blood & Blood Components in a Blood Centre of Tertiary Care Hospital

Ruksar Sultana[1]; Dr. Gireesh V. Achalkar[2]

[2]Guide

Dissertation submitted to the
[1,2]Rajiv Gandhi University of Health Sciences, Bengaluru, Karnataka

In Partial Fulfillment of the requirement for the degree of
[1]Master in Medical Laboratory Technology
Haematology & Blood Transfusion

[2]Shridevi Institute of Allied Health Sciences, Lingapura, Sira Road, Tumakuru- 572106

Publication Date: 2026/07/28

How to Cite: Ruksar Sultana; Dr. Gireesh V. Achalkar (2026) Study on Analysis of Reasons for Discarding Blood & Blood Components in a Blood Centre of Tertiary Care Hospital. *International Journal of Innovative Science and Research Technology*, 11(7), 1422-1451. https://doi.org/10.38124/ijisrt/26jul968

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

DECLARATION BY THE CANDIDATE

I hereby declare that this dissertation entitled " STUDY ON ANALYSIS OF REASONS FOR DISCARDING BLOOD & BLOOD COMPONENTS IN A BLOOD CENTRE OF TERTIARY CARE HOSPITAL" is a bonafide & genuine work carried out by me under the guidance of Dr. Gireesh V Achalkar Professor & HOD of Pathology, Shridevi Institute of Allied Health Sciences, Sira road, Tumkur.

Ms. RUKSAR SULTANA

Date: 15/07/2024
Place: Tumkur

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

CERTIFICATE BY THE GUIDE

This is to certify that the dissertation entitled" STUDY ON ANALYSIS OF REASONS FOR DISCARDING BLOOD & BLOOD COMPONENTS IN A BLOOD CENTRE OF TERTIARY CARE HOSPITAL" is a bonafide research work done by Ms. RUKSAR SULTANA in partial fulfillment of the requirement for the degree of MASTER IN MEDICAL LABORATORY TECHNOLOGY - Haematology & Blood Transfusion.

Dr. Gireesh V Achalkar

Professor & HOD
Department of Pathology
Shridevi Institute of Allied Health Sciences, Sira road,
Tumkur, Karnataka- 572106

Date: 15/07/2024
Place: Tumakuru

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

ENDORSEMENT BY THE PRNICIPAL OF THE INSTITUTE

This is to certify that the dissertation entitled " STUDY ON ANALYSIS OF REASONS FOR DISCARDING BLOOD & BLOOD COMPONENTS IN A BLOOD CENTRE OF TERTIARY CARE HOSPITAL" is a bonafide research work done by Ms. Ruksar Sultana under the guidance of Dr. Gireesh V Achalkar, Professor & HOD, Department of Pathology, Shridevi Institute of Allied Health Sciences, Sira road, Tumkur.

Dr. Krishna M C
Principal
Shridevi Institute of Allied Health Sciences, Sira road,
Tumkur, Karnataka- 572106

Date: 15/07/2024
Place: Tumkur

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

COPYRIGHT DECLARATION BY THE CANDIDATE

I hereby declare that the RAJIV GANDHI UNIVERSITY OF HEALTH SCIENCES, Karnataka shall have the rights to preserve, use & disseminate this project in print or electronic format for academic research purpose.

Ms. RUKSAR SULTANA

Date: 15/07/2024
Place: Tumkur

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

ACKNOWLWDGEMENT

This research study has been completed with guidance, suggestion and help from many individuals. I am deeply indebted to those who have contributed to this research study and madi it possible. First of all, I would like to express my sincere gratitude to Rajiv Gandhi University of Health Sciences, Bangaluru and Shridevi Institute of Allied Health Sciences, Sira Road, Tumkur, Karnataka for providing me this opportunity to carry out this project work as partial fulfillment of Master in Medical Laboratory Technology.

It is my proud privilege to express my sincere thanks and heartful gratitude to my Guide Dr. Gireesh V Achalkar, Professor and HOD, Department of Pathology, Shridevi Institute of Allied Health Sciences, Sira Road, Tumkur, for his constant supervision, encouragement and valuable guidance in carrying out this project work to its final stage.

I express my deepest sense of gratitude to my esteemed Principal Dr. Krishan M C, Shridevi Institute of Allied Health Sciences, Sira Road, Tumkur, who deserve the respect, the esteem and the gratitude for his presence, warmth, inspiration, words of encouragement and his untiring guidance, showing immense interest and support throughout the course of the study.

I would like to express my deepest gratitude to DR Parimala T V, HOD of Microbiology, Shridevi Institute of Allied Health Sciences, Sira Road, Tumkur, for her significant and unconditional support and guidance.

I wish to express my thanks to Ms. Punitha U, Mr. Zahid Akram, Ms. Pallavi G H, Ms. Kavyashree G, Mr. Kiran K Blood Centre Technicians, Shridevi Institute of Medical Sciences and Research Hospital, Sira Road, Tumkur, for their grateful support throughout the course of study.

My heartfelt thanks to entire teachers and staffs of the Shridevi Institute of Allied Health Sciences who always encouraged and helped me in all my academic endeavourd.

Finally, I pay my grateful salution to my Father Mr. Mohamed Sadiq Pasha, my mother Mrs. Syeda Asma Banu and my friend colleague Mr. Somashekar Sankdal for their support, motivation and best wishes that helped me to carry out my study successful.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

LIST OF ABBREVATIONS

- WHO- World Health Organization
- WB- Whole Blood
- PRBC- Packed Red Blood Cell
- FFP- Fresh Frozen Plasma
- PC- Platelet Concentrate
- FDA- Food & Drug Administration
- HIV – Human Immunodeficiency Virus
- TTI – Transfusion Transmitted Infection
- NACO- National AIDS Control Organization
- BTS- Blood Transfusion Services
- NABH- National Accreditation Board for Hospitals & HealthCare Providers
- ACD- Acid Citrate Dextrose
- CPDA-1 – Citrate Phosphate Dextrose Adenine-1
- ^{0}C – Degree Celsius
- ICU- Intensive Care Unit
- Hb – Hemoglobin
- PRP- Platelet Rich Plasma
- SCD- Sterile Connecting Device
- SAGM- Saline Adenine Glucose Mannitol
- BC- Buffy Coat
- RDP- Random Donor Platelet
- CPP- Cryo Poor Plasma
- CLIA – Chemiluminescent ImmunoAssay
- PVC- Polyvinylchloride
- BMW- Biomedical Waste Management
- NAT – Nucleic Acid Testing
- SIMS & RH- Shridevi Institute of Medical Sciences & Research Hospital

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

CONTENTS

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

LIST OF TABLES

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

LIST OF FIGURES

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

ABSTRACT

➢ ***Background:***

Blood and blood components are indispensable therapeutic resources that play a vital role in modern healthcare. Owing to their limited shelf life and the increasing demand for transfusion therapy, efficient utilization of these resources is essential. Nevertheless, a proportion of collected blood units is discarded due to preventable and unavoidable factors, resulting in unnecessary wastage and financial burden on healthcare institutions. Identifying the underlying causes of blood component discard is crucial for strengthening inventory management, improving quality assurance practices, and promoting optimal utilization of donated blood.

➢ ***Aim:***

To evaluate the discard rates of whole blood and blood components and to determine the major factors responsible for their discard in the blood centre of a tertiary care teaching hospital.

➢ ***Materials and Methods:***

A prospective observational study was conducted at the Blood Centre, Shridevi Institute of Medical Sciences and Research Hospital, Tumakuru, Karnataka, over a one-year period from July 2023 to June 2024. Information was collected from donor records, blood component preparation registers, discard registers, transfusion-transmitted infection (TTI) registers, and master registers. Blood components were prepared in accordance with National AIDS Control Organization (NACO) guidelines. Screening for TTIs was performed using Chemiluminescence Immunoassay (CLIA). The collected data were compiled using Microsoft Excel and analyzed using descriptive statistics, with results expressed as frequencies and percentages.

➢ ***Results:***

During the study period, 1,342 whole blood donations were collected, of which 1,336 (99.6%) units underwent component separation, producing a total of 3,399 blood components. Among these, 326 units were discarded, resulting in an overall discard rate of 9.59%. Component-wise discard rates were 16.66% for whole blood, 2.54% for packed red blood cells (PRBC), 5.81% for fresh frozen plasma (FFP), and 29.23% for platelet concentrates (PC), with platelet concentrates exhibiting the highest discard rate. Expiry of components accounted for the majority of discards (67.79%), followed by leakage (14.72%), transfusion-transmitted infection positivity (7.97%), inadequate blood collection (7.05%), lipemic plasma (1.22%), and red blood cell contamination (1.22%). Among TTI-reactive donations, hepatitis B surface antigen (HBsAg) positivity was the predominant cause, followed by syphilis (VDRL) and HIV. No positive cases of hepatitis C virus (HCV) or malaria were identified during the study period.

➢ ***Conclusion:***

Expiry of blood components, particularly platelet concentrates, was identified as the leading cause of discard. Strengthening inventory management, implementing demand-based component preparation, ensuring strict adherence to standard operating procedures, improving donor screening practices, and enhancing inter-blood centre coordination can substantially reduce blood wastage. Continuous monitoring of discard patterns and periodic quality assessment are essential for maximizing the effective utilization of this valuable healthcare resource.

Keywords: *Blood Components; Blood Discard; Packed Red Blood Cells; Fresh Frozen Plasma; Platelet Concentrate; Blood Centre; Transfusion Medicine; Transfusion-Transmitted Infections; Inventory Management; Quality Indicators.*

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

CHAPTER ONE
INTRODUCTION

➢ *Introduction*

Blood is an indispensable biological resource that supports life by transporting oxygen, nutrients, hormones, and other essential substances to tissues while facilitating the removal of metabolic waste products. In modern healthcare, blood and blood components transfusion has become an integral component of patient management and is often indispensable during medical emergencies, major surgical procedures, trauma care, obstetric complications, hematological disorders, and intensive care management. Since no artificial product can completely replace the physiological functions of human blood, an uninterrupted supply of safe blood and blood components remains a fundamental requirement for every healthcare system.

Recognizing its critical importance, the World Health Organization (WHO) has included blood among the essential medicines required for healthcare delivery. In India, human blood is regulated under the Drugs and Cosmetics Act, 1940 and the Drugs and Cosmetics Rules, 1945, emphasizing that blood is not merely a donated biological material but a regulated therapeutic product that must meet stringent standards of quality, safety, storage, and distribution. Therefore, every unit collected from a voluntary donor should be processed, stored, and utilized responsibly to maximize its clinical benefit.

Advances in transfusion medicine have transformed the practice of whole blood transfusion into component therapy. A single unit of donated whole blood can be separated into packed red blood cells (PRBCs), fresh frozen plasma (FFP), platelet concentrates (PC), and other components, allowing one donation to benefit multiple patients with different clinical requirements. Component therapy improves transfusion efficacy, minimizes unnecessary exposure to blood constituents, conserves valuable resources, and supports evidence-based patient care.

The increasing prevalence of complex surgical interventions, trauma care, cancer chemotherapy, organ transplantation, neonatal care, and hereditary hematological disorders has substantially increased the demand for blood and blood components. Patients with conditions such as thalassemia major, aplastic anemia, and various malignancies often require repeated transfusions throughout the course of treatment. Consequently, blood centres must maintain an adequate inventory to ensure timely availability while avoiding unnecessary shortages or wastage.

Blood centres function within a challenging environment where they must balance blood collection with clinical demand. Maintaining this balance is particularly difficult because blood components have limited shelf lives. Platelet concentrates can generally be stored only for a few days, packed red blood cells remain suitable for several weeks under prescribed storage conditions, and fresh frozen plasma requires uninterrupted cold-chain maintenance for long-term preservation. Consequently, ineffective inventory management, inaccurate demand forecasting, or delays in utilization may result in avoidable expiration and discard of valuable blood components.

Despite continuous improvements in donor recruitment, component preparation, storage technology, and quality assurance, blood and blood components continue to be discarded for several reasons. Common causes include expiry before utilization, transfusion-transmitted infection (TTI) reactivity, inadequate blood collection, leakage or damage to blood bags, contamination, hemolysis, lipemic plasma, and deviations from established quality standards. Each discarded unit represents the loss of a scarce biological resource, increased operational expenditure, and reduced availability of blood for patients in need.

The discard of blood components also serves as an important quality indicator for blood centres. Regular evaluation of discard patterns enables identification of operational deficiencies related to donor selection, component preparation, inventory management, storage practices, transportation, and clinical utilization. Continuous monitoring of these parameters helps strengthen quality management systems, improve staff training, optimize stock management, and reduce avoidable wastage while ensuring patient safety.

In India, national organizations such as the National AIDS Control Organization (NACO) and the National Accreditation Board for Hospitals and Healthcare Providers (NABH) recommend continuous monitoring of blood component discard rates as an essential quality indicator. Systematic assessment of discard trends facilitates evidence-based planning, improves utilization of donated blood, and promotes adherence to national standards governing blood transfusion services.

Considering the increasing demand for blood components and the limited availability of voluntary blood donations, minimizing unnecessary discard has become an important objective of transfusion services. Identification of the major causes responsible for blood and blood component wastage provides opportunities to implement corrective measures, optimize inventory practices, reduce financial burden, and improve overall efficiency of blood centre operations.

The present prospective observational study was therefore undertaken at the Blood Centre of Shridevi Institute of Medical Sciences and Research Hospital, Tumakuru, to evaluate the discard rate of whole blood and blood components and to analyze the

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

factors responsible for their discard. The findings are expected to contribute towards improving quality assurance practices, strengthening inventory management, and promoting the judicious utilization of this invaluable therapeutic resource.

➢ *Aims & Objectives*

- *Aim:*

✓ Analyzing the reasons for discarding blood and blood components in a blood centre of tertiary care hospital.

- *Objectives:*

✓ To identify the frequently & types of blood & blood components discarded over a defined study period.
✓ To determine the primary causes leading to discards.
✓ To assess the impact of discard rates on blood inventory management & suggest preventive measures.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

CHAPTER TWO
REVIEW OF LITERATURE

Blood is a specialized bodily fluid that delivers necessary substance to the organs such as nutrients and oxygen and transport waste products away from them.

Approximately a century ago, it was recognized that blood transfusion was only possible if the donated blood was not clotted. Citrate mixtures were developed at first only to anti-coagulate the blood, allowing storage for a few days. Later, "nutrients" such as dextrose for the red cells were added to the formula, extending the storage time of whole blood in acid citrate dextrose (ACD) solution to 3 weeks[14]. In the 1960s, phosphate and adenine were applied in citrate-phosphate-dextrose-adenine-1(CPDA-1) because of which the storage time was extended to 4 weeks[15].

During World War II, sterile glass bottles with a rubber stopper that was kept in place by a metal cap were used on a large scale to collect and store whole blood[14]. To collect blood and later in the process to remove plasma or other components, an air vent and a long needle had to be inserted through this rubber stopper. Therefore, collection and processing took place in an open system, with a high chance of bacterial contamination that ranged between 2% and 5%[16,17]. Scarce case reports describe fatal events after transfusion of contaminated blood due to various omissions in the sterilization procedures, blood collection, or storage[16,18]. For safety reasons, the storage time was reduced to 24 hours after opening when the component was stored at 2°C–6°C and to 6 hours when storage took place at ambient temperature. This measure is still in place if the closed system of a transfusion product is opened. Blood processing became possible in a closed system only when fully integrated steam sterilized systems, consisting of multiple plastic bags connected by tubing, came onto the market in the 1960s[19]. At that time, this was a major step forward regarding patient safety.

Today, automated equipment for collecting whole blood in plastic bags, mixing, measuring the blood flow, weighing the blood components, calculating the collection time, and documenting all data has been developed and has contributed to the safety by collecting a standardized volume of blood.

The transfusion of blood and blood components has become an integral part of patient management in modern medicine[5].The requirement of blood is there in every two second[8]. One third of all patients admitted to intensive care units (ICUs) in the developed world receive a blood transfusion[3]. Blood and its components are very significant for human life and therefore blood transfusion can be a life-saving intervention[2]. Both the medical and surgical specialists require the steady supply of blood from healthy, caring donors.

Blood donation is one of the noblest gestures; a human can make to save life. A major challenge facing the blood transfusion service (BTS) is to supply sufficient amount of safe blood whenever required for which we need to double our efforts to collect sufficient amount of safe blood from voluntary, non-remunerated, healthy donors[5,9,10]. The BTS can reach the highest levels of efficiency in terms of quantity and quality of blood and blood components through the implementation of a quality management system from the collection, processing to storage of the blood. The efficiency of processing and preparation of the blood components can be monitored by establishing quality parameters which reflect the activities to be evaluated[11].

Human blood till date has no substitute[1,4]. Demand of blood and its components always outpace its supply. Advances in medical technology demand more and more provision of safe blood for effective management of patients[6]. Many chronic medical conditions such as chemotherapy and thalassemia depend on continuous supply of blood from healthy donors. Each unit of blood is precious and has to be utilized properly with minimal wastage[10,11]. There are multiple process that contribute to shortfall in provision of blood which includes donor recruitment, donor selection, blood collection, testing and processing, storage and transportation and finally, transfusion of the blood unit into the patient.

As different blood component has different relative densities and specific gravity they are separated into various blood components when centrifugal force is applied. Indication of whole blood uses limited to acute blood loss, i.e. hypovolemic shock and exchange transfusion only. Transfusion of PRBC is useful in chronic symptomatic anemia and conditions of severe blood loss. FFP is used in multiple coagulation factor deficiency and liver diseases where coagulation profile is impaired. Platelet components are used in bleeding due to low platelet count or impaired platelet function[12].

The whole blood can be separated into different components namely PRBC, PC, FFP. It can be a life-saving procedure when given appropriately at the right time in a safe manner[8,9].

The components are prepared by centrifugation of one unit of whole blood. Whole blood is a mixture of cellular elements, colloids and crystalloids. As different blood components have different relative density, sediment rate and size they can be separated when centrifugal force is applied. In increasing order, the specific gravity of blood components is plasma, platelets, and

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

packed red blood cells (PRBCs). Functional efficiency of each component is dependent on appropriate processing and proper storage. To utilize one blood unit appropriately and rationally, component therapy is to be adapted universally[13].

- *Blood Components, Component Preparation, Storage and Shelf Life*

Whole blood collected from a healthy donor serves as the primary source for the preparation of various blood components used in transfusion therapy. The development of component therapy has significantly improved the efficiency of blood utilization by allowing a single donated unit to benefit multiple patients with different clinical needs. Rather than transfusing whole blood routinely, modern transfusion practice recommends administering only the specific component required for treatment, thereby improving therapeutic outcomes and minimizing unnecessary exposure to blood constituents.

Blood components are prepared using standardized centrifugation techniques under controlled laboratory conditions. Following collection, whole blood is processed within the recommended time frame using refrigerated centrifuges to separate its cellular and plasma constituents. The prepared components are then stored under prescribed environmental conditions to preserve their quality, viability, and functional properties until transfusion.

Packed Red Blood Cells (PRBCs) are prepared by removing a major portion of plasma from whole blood. These components are primarily indicated for patients with symptomatic anaemia, acute blood loss, chronic transfusion-dependent disorders, and surgical procedures associated with significant blood loss. PRBC units are stored under refrigerated conditions between 2°C and 6°C, and their shelf life varies according to the anticoagulant-preservative solution used during collection. Proper temperature monitoring throughout storage and transportation is essential to maintain red cell viability and reduce the risk of bacterial proliferation.

Fresh Frozen Plasma (FFP) is obtained by separating plasma from whole blood and freezing it within the recommended time after collection to preserve coagulation factors. FFP contains all major plasma proteins, clotting factors, albumin, and immunoglobulins. It is commonly administered for the management of coagulation factor deficiencies, liver disease, disseminated intravascular coagulation, massive transfusion protocols, and plasma exchange procedures. FFP is stored at temperatures of −30°C or below, enabling prolonged preservation while maintaining coagulation factor activity.

Platelet Concentrates (PCs) are prepared either from individual whole blood donations or by apheresis procedures. Platelets play an essential role in haemostasis and are indicated for the prevention and treatment of bleeding associated with thrombocytopenia or platelet dysfunction. Unlike other blood components, platelet concentrates require continuous gentle agitation during storage at 20–24°C to preserve platelet function. Because of their unique storage conditions, platelet concentrates have a comparatively short shelf life, making them particularly susceptible to expiry and wastage if inventory is not managed efficiently.

Cryoprecipitate is prepared from fresh frozen plasma through controlled thawing at low temperatures. It is enriched with fibrinogen, factor VIII, factor XIII, von Willebrand factor, and fibronectin. Cryoprecipitate is mainly used for the treatment of hypofibrinogenaemia, congenital fibrinogen deficiencies, and selected bleeding disorders when specific factor concentrates are unavailable.

The preparation of blood components requires strict adherence to standard operating procedures and quality assurance protocols. Every stage—including donor selection, blood collection, centrifugation, component separation, labelling, storage, transportation, and issue—must comply with national regulatory standards to ensure patient safety and product quality. Routine quality control testing is performed to verify component volume, cellular content, sterility, storage conditions, and overall product integrity.

The storage characteristics of blood components directly influence inventory management within blood centres. Since each component has a defined storage period, continuous monitoring of stock levels, demand forecasting, and timely utilization are essential to minimize unnecessary discard. Platelet concentrates, owing to their limited shelf life, consistently demonstrate the highest discard rates in many blood centres worldwide, whereas red cell components generally exhibit lower discard rates because of their comparatively longer storage duration.

Advances in blood banking technology, including automated component extractors, computerized inventory systems, temperature monitoring devices, and improved preservative solutions, have enhanced the quality and availability of blood components. Nevertheless, effective inventory management, adherence to quality standards, and continuous monitoring of component utilization remain fundamental for reducing wastage and ensuring optimal use of donated blood.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

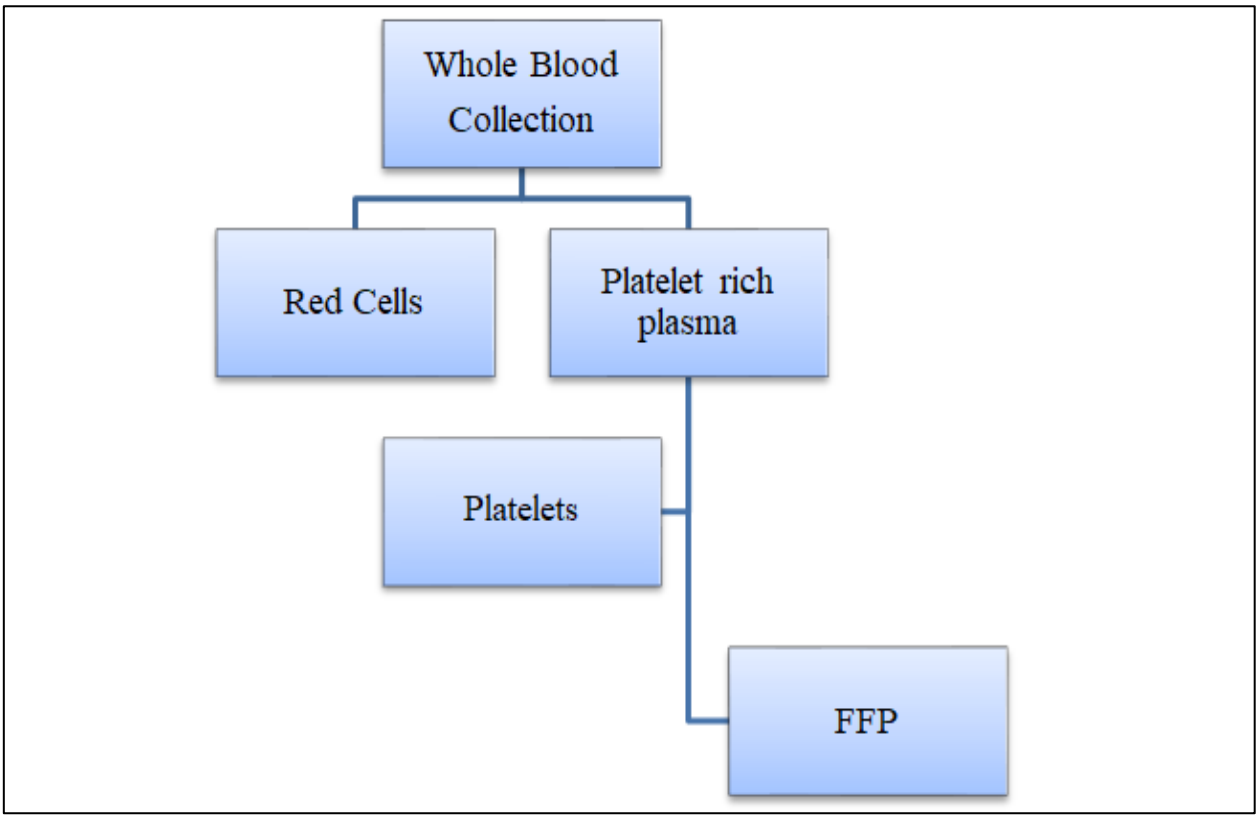

Fig 1 Showing Flowchart of Blood Components Separation from Whole Blood

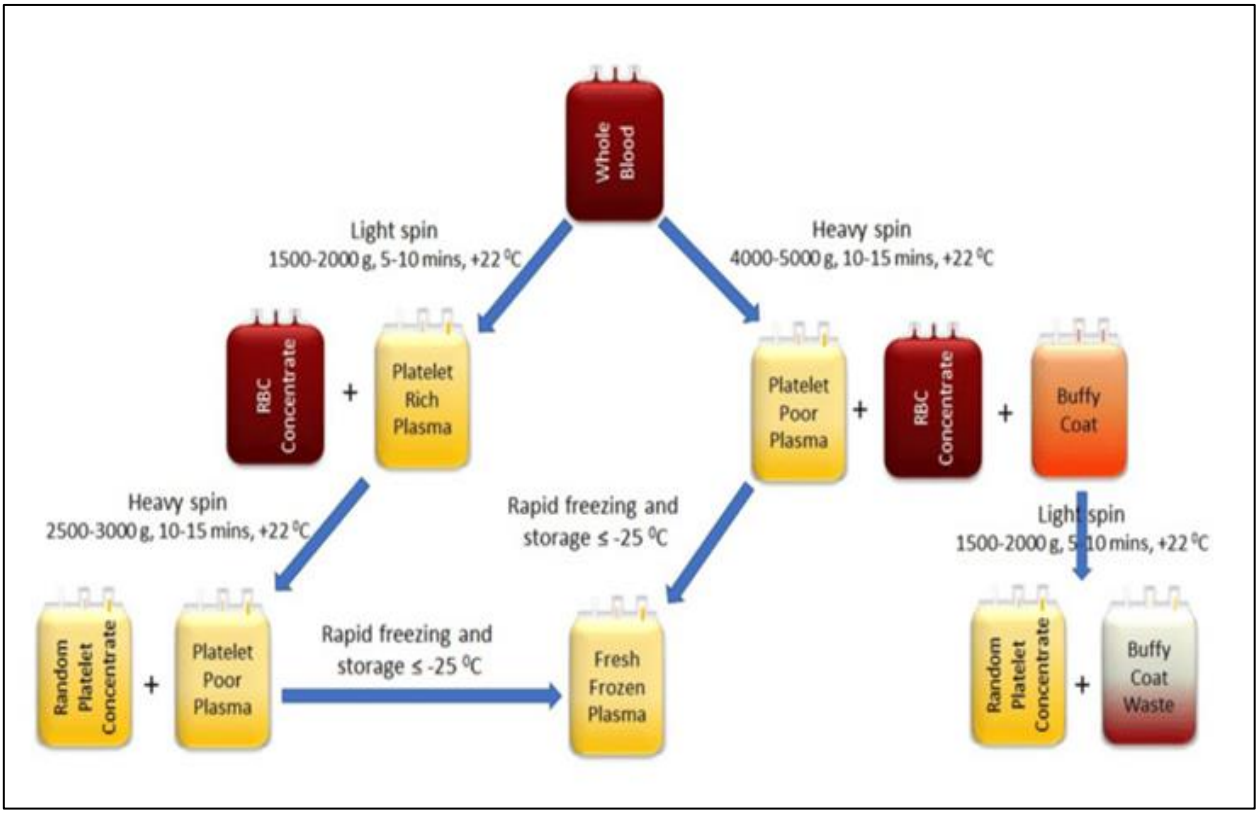

Fig 2 Showing Blood Components Preparation from Whole Blood
Courtesy: Simon TL, Snyder EL, Solheim BG, Stowell CP, Strauss RG, Petrides M. editors. Rossi's Principles of Transfusion Medicine. 4th ed. West Sussex, UK: AABB Press-Blackwell Publishing Ltd.; 2009.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

Table 1 Storage and Expiration of Blood and Blood Components

Product	Storage Conditions	Expiration Period	Shipping
Packed Red cell	1° C and 6° C	21-42 days from collection as marked; irradiated units have expiration of no more than 28 days; units that have been spiked expire 24 hours from time entered if refrigerated, and 4 hours if at room temperature.	On ice or with frozen chemical coolant in ARC boxes or cooler.
Platelets	20° C – 24° C with agitation. Maximum time without agitation is 24 hours.	5 days from collection	No ice in ARC platelet boxes
Fresh Frozen Plasma	At or below –18° C Thawed: 1°C – 6° C	Frozen FFP: 1 yr from collection Thawed Plasma: 5 days	In ARC boxes with dry ice.

- *TTI Testing*

Serologic testing for transfusion transmitted diseases had historically been the foundation of blood screening, while newer strategies like CLIA have helped further shorten the "window period"[21] . Some pathogens are not easily detected through RBDM and require a laboratory-based strategy, using serological- (detection of antibodies with or without antigens) and/or nucleic acid testing (NAT). There are advantages and disadvantages of each strategy. Serological testing is undertaken using a variety of different technologies [e.g., Enzyme linked immunosorbent assay (ELISA), chemiluminescent immunoassay (CLIA), etc.]. The presence of antibodies generally reflects exposure rather than active infection. With some pathogens (notably chronic viruses e.g., HIV), it may reflect active infection. Serological assays are lower cost than NAT, readily available and have a variety of formats, spanning rapid/point of care, semi-automated and fully automated. Rapid tests are typically not validated for blood donor screening; consequently, they lack comparable sensitivity and specificity of automated assays[22,23]. They are most commonly used in low resource settings given the low cost and ease of use[23].

- *Disposal of Blood Bags*

The blood / blood components units which need disposal are:

✓ Units which have tested positive for infectious agents.
✓ Unsuitable products, such as under- and overweight blood packs
✓ Those where the storage temperature has not been maintained.
✓ Expired units.
✓ Blood returned unused but unsuitable for reissue.
✓ Blood packs in which leaks have been detected.

Secure and exclusive quarantine storage must be done for blood units awaiting disposal. Discarded blood components must not be left at room temperature, but should be stored in a designated compartment refrigerated to minimize bacterial growth. It is important to keep discarded products under a security lock to reduce the risk of misuse & prevent access by unauthorized persons.

The treatment of PVC blood bags forms an integral part of BMW management. Discarded blood & blood products need to be safely treated & disposal of in an environment-friendly way.

These are autoclaved at $+121^0$ C for 20 minutes as autoclaving of PVC blood bags are safer & reliable method as compared to chemical disinfection. Therefore, blood bags are discarded in Red Plastic Bags[24].

✓ *Disposal of Blood Bags Expired and Returned from Facilities:*

All returned units must be first autoclaved with bags then handed to BMW collecting agency.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

Fig 3 Showing Disposal of Blood Bags Expired and Returned from Facilities
Courtesy: At Shri Devi Blood Centre

✓ *Disposal of Reactive Blood Bags:*
First treat with 1.0% sodium hypochloride for 24 hours, then autoclave the blood bag and handed to BMW agency.

Fig 4 Showing Treating with 1.0% Sodium Hypochloride for Disposal of Reactive Blood Bags
Courtesy: At Shri Devi Blood Centre

✓ *Disposal of empty blood bags:*
Empty blood bags must be cut and disinfected and handed to BMW agency.

The facilities not covered by BMW agencies should autoclave the blood bag by a dedicated BMW autoclave & then disposed off in the deep burial pit.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

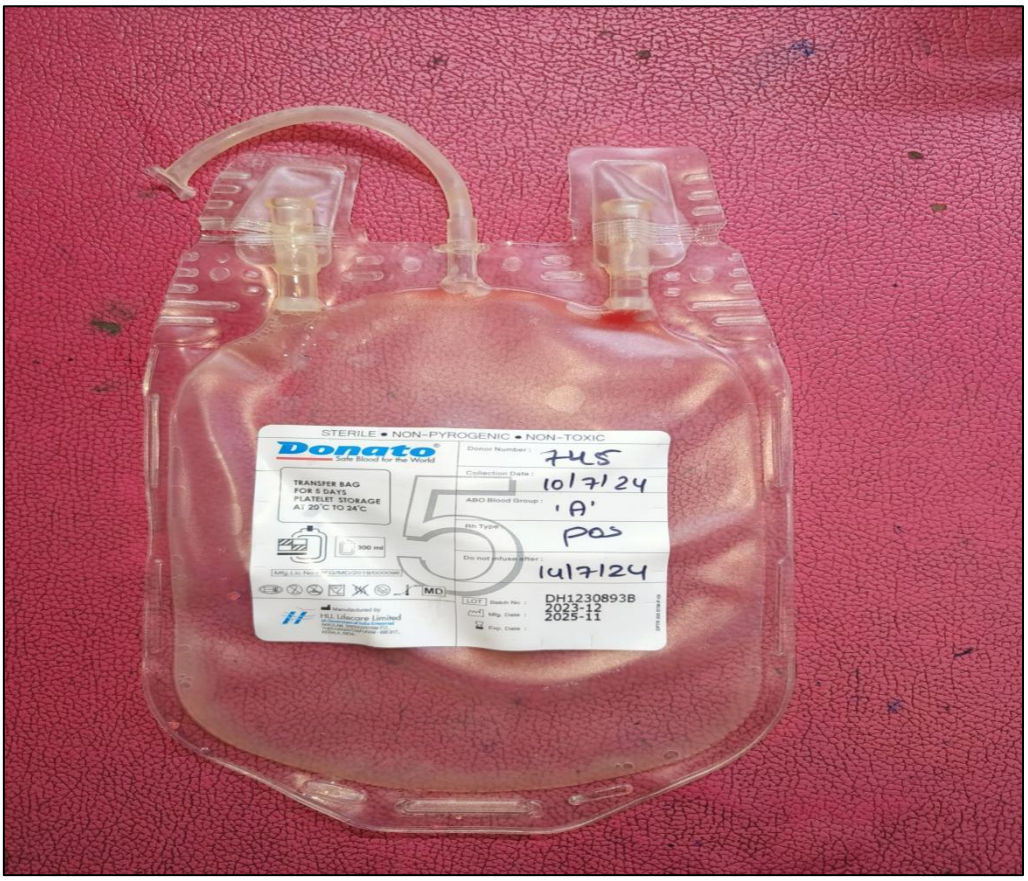

Fig 5 Showing Disposal of Empty Blood Bags
Courtesy: At Shri Devi Blood Centre

Documentation of each unit discarded should be maintained.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

CHAPTER THREE
MATERIALS & METHODS

A prospective study was conducted on various causes of discard of blood & blood components carried out in Blood Centre of a tertiary care hospital from the data collected from the blood donation of voluntary donors from July 2023 to June 2024. Blood donation was carried out according to donor selection criteria laid down by WHO[7]. This study includes the reasons of discard of whole blood, PRBC, FFP, PC. Data was collected from Donor register, Discard Register, Master Register, TTI Register, Component preparation register.

Details of daily amount of blood collection, number of each component prepared and the various reasons and parameters for discard of blood and blood components, like sero-positivity for TTI, date expiry, low volume, and others (Leakage, RBC contamination, Hemolysis) were analyzed. The blood bags were discarded according to Standard Operating Procedures laid down by National AIDS Control Organization (NACO)[25s], Local authorities and our blood centre. The components were prepared as per Drugs & Cosmetic act 1940 and 1945 rules. CPDA blood bag was used for whole blood collection and SAGM was used as preservative in PRBC. All the blood and blood components were screened for TTI by CLIA method.

- *Inclusion Criteria:*
  All blood and blood products discarded in Blood Centre.

- *Exclusion Criteria:*
  All the blood and blood products submitted for culture and sensitivity and Therapeutical phlebotomy blood bags.

- *Sampling Method:*
  A probability sampling method that is simple random sampling method.

- *Statistical Method:*
  Collected data was entered in Microsoft Excel sheet and was presented in frequency and percentage.

- *Ethical Consideration:*
  Ethical approval was obtained from the research and ethical committee by the college of Shridevi Institute of Medical Sciences & Research Hospital, Tumkur.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

CHAPTER FOUR
RESULT & ANALYSIS OF DATA

A total of 1,342 blood donations were recorded during the study period through voluntary blood donation camps and in-house collections. Among these donors, 1,299 (96.79%) were males and 43 (3.21%) were females, demonstrating that blood donation was predominantly contributed by male donors (Table 2).

Out of the total blood units collected, 1,336 (99.55%) were separated into blood components, whereas 6 units (0.45%) were retained as whole blood. The overall discard rate of blood and blood components during the study period was 9.59%. Component-wise evaluation revealed discard rates of 16.66% for whole blood, 2.54% for packed red blood cells (PRBCs), 5.81% for fresh frozen plasma (FFP), and 29.23% for platelet concentrates, with platelet concentrates contributing the highest proportion of discarded units (Table 3).

A total of 1,336 PRBC units were prepared during the study period. Of these, 34 units (2.54%) could not be utilized and were discarded. Expiry of the product was identified as the major reason, accounting for 20 units (58.82%). Seroreactivity for transfusion-transmissible infections (TTIs) was responsible for the discard of 10 units (29.41%), while 4 units (11.76%) were discarded because the collected volume was below the acceptable limit (Table 7).

Among the plasma components, 1,325 FFP units were prepared, representing 98.72% of the processed blood units. A total of 77 FFP units (5.81%) were discarded. The leading cause of discard was bag leakage or breakage, which accounted for 48 units (62.33%). Other reasons included low volume in 13 units (16.88%), TTI positivity in 10 units (12.98%), lipemic plasma in 4 units (5.19%), and red blood cell contamination in 2 units (2.59%) (Table 7).

Platelet concentrates showed the highest wastage among all blood components. During the study period, 732 random donor platelet (RDP) units were prepared, of which 214 units (29.23%) were discarded. The limited shelf life of platelets resulted in expiry being the predominant cause, accounting for 200 units (93.45%). In addition, 6 units (2.80%) were discarded due to TTI positivity, another 6 units (2.80%) because of inadequate quantity, and 2 units (0.93%) owing to red blood cell contamination (Table 7).

Seropositivity for transfusion-transmissible infections also contributed to the overall discard of blood components. As presented in Table 6, 26 units were discarded because of positive screening results. HBsAg positivity was the most frequently encountered cause, accounting for 18 units, followed by VDRL positivity in 4 units and HIV-1/2 positivity in 3 units. None of the discarded units tested positive for HCV or malarial parasite, indicating that these infections did not contribute to blood component discard during the study period.

➢ *Analysis of Data*

- *Gender Wise Total Number Of Blood Collection*

Table 2 Gender Wise Total Number of Blood Collection

SL.NO	GENDER	NUMBER	PERCENTAGE
01	Male	1299	96.79%
02	Female	43	3.21%
	Total	1342	

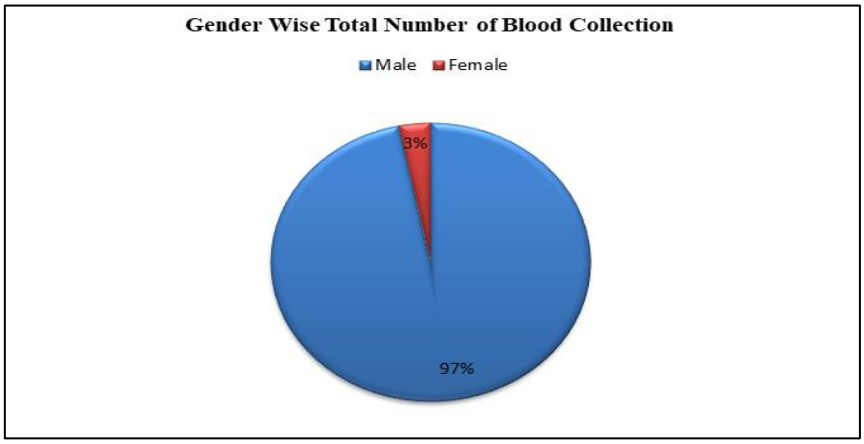

Fig 6 Gender Wise Total Number of Blood Collection

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

- *Total Units of Blood & Blood Components Collected*

Table 3 Total Units of Blood & Blood Components Collected

Sl.No	Month	WB	PRBC	FFP	PC
01	July-2023	0	88	88	38
02	Aug-2023	02	103	103	60
03	Sep-2023	0	126	123	66
04	Oct-2023	03	123	123	87
05	Nov-2023	0	109	109	65
06	Dec-2023	0	85	83	49
07	Jan-2024	0	130	130	54
08	Feb-2024	0	181	175	79
09	March-2024	01	114	114	57
10	April-2024	0	73	73	47
11	May-2024	0	121	121	77
12	June-2024	0	83	83	53
	Total	06	1336	1325	732

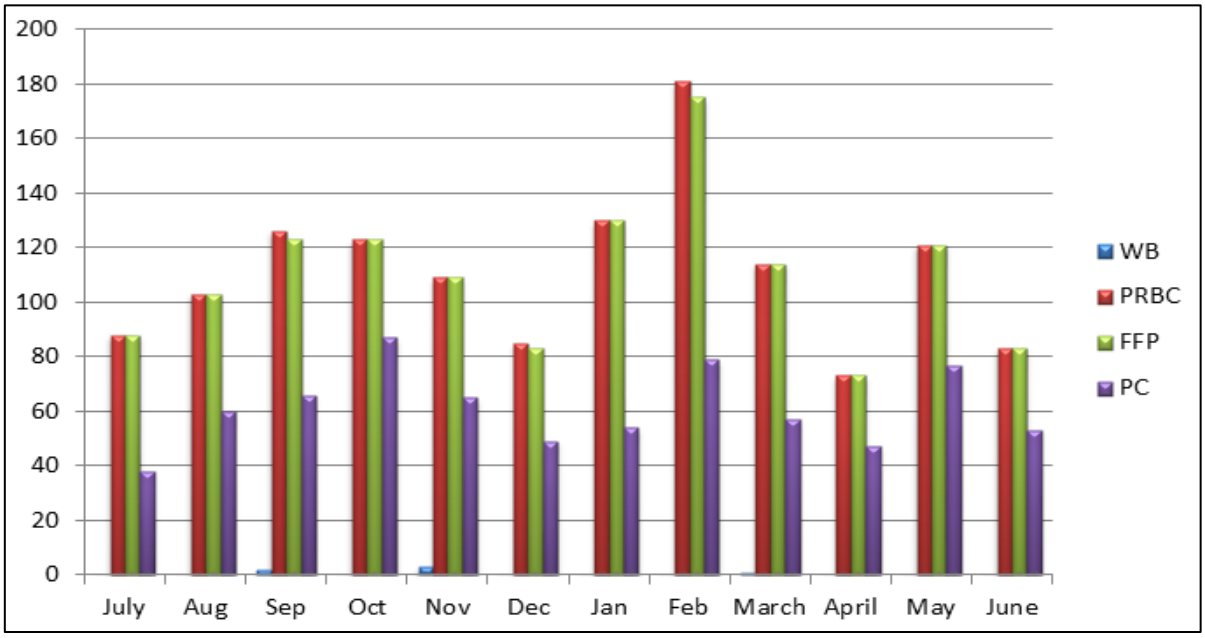

Fig 7 Total Units of Blood & Blood Components Collected
X-axis Represents Month of the Year
Y-axis Represents Number of Blood and Blood Components

- *Analysis of Blood & Blood Components Discarded*

Table 4 Analysis of Blood & Blood Components Discarded

SL. NO.	MONTH	WB	PRBC	FFP	PC
01	July-2023	0	05	22	25
02	Aug-2023	0	03	08	16
03	Sep-2023	0	01	01	02
04	Oct-2023	0	03	05	13
05	Nov-2023	0	08	09	06
06	Dec-2023	0	06	01	23
07	Jan-2024	0	01	05	17
08	Feb-2024	0	02	01	11
09	March-2024	0	02	07	17
10	April-2024	01	01	04	17
11	May-2024	0	00	07	27
12	June-2024	0	02	07	40
	Total	01	34	77	214

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

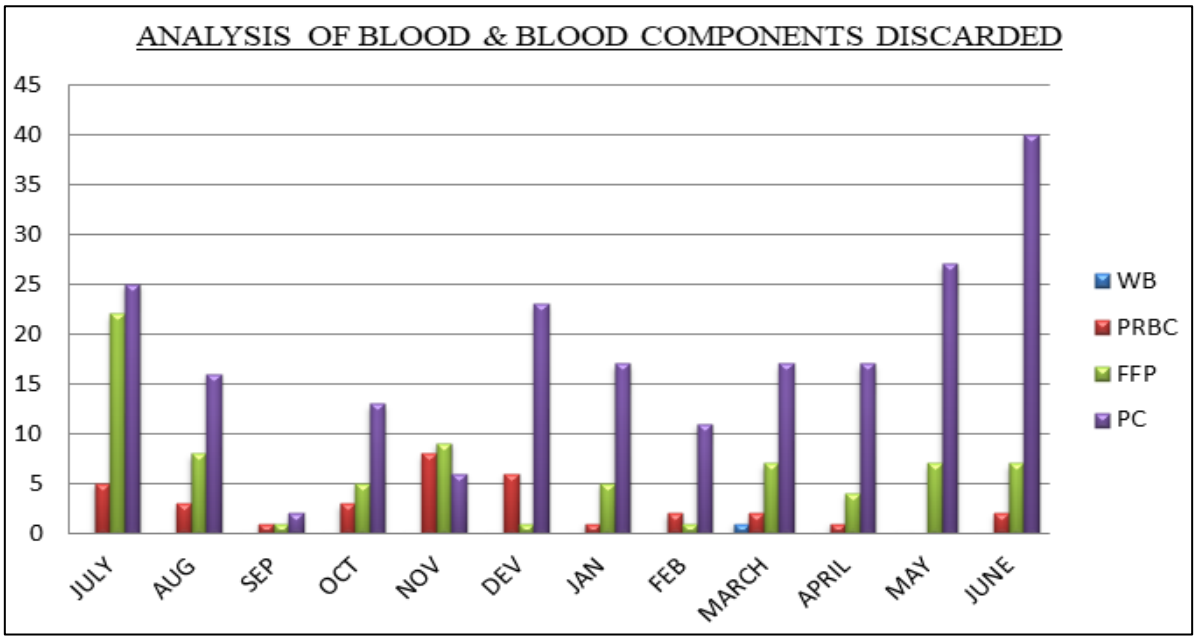

Fig-8 Analysis of Blood & Blood Components Discarded
X-axis Represents Month of the Year
Y-axis Represents Number of Blood and Blood Components Discraded

- *Analysis of Blood Units Discarded Against Total Blood Components Prepared*

Table 5 Analysis of blood units Discarded Against Total Blood Components Prepared

COMPONENTS	NO. OF COMPONENTS PREPARED	NO. OF UNITS DISCARDED	DISCARD RATE(%)
WB	06	01	16.66
PRBC	1336	34	2.54
FFP	1325	77	5.81
PC	732	214	29.23
TOTAL	3399	326	9.59

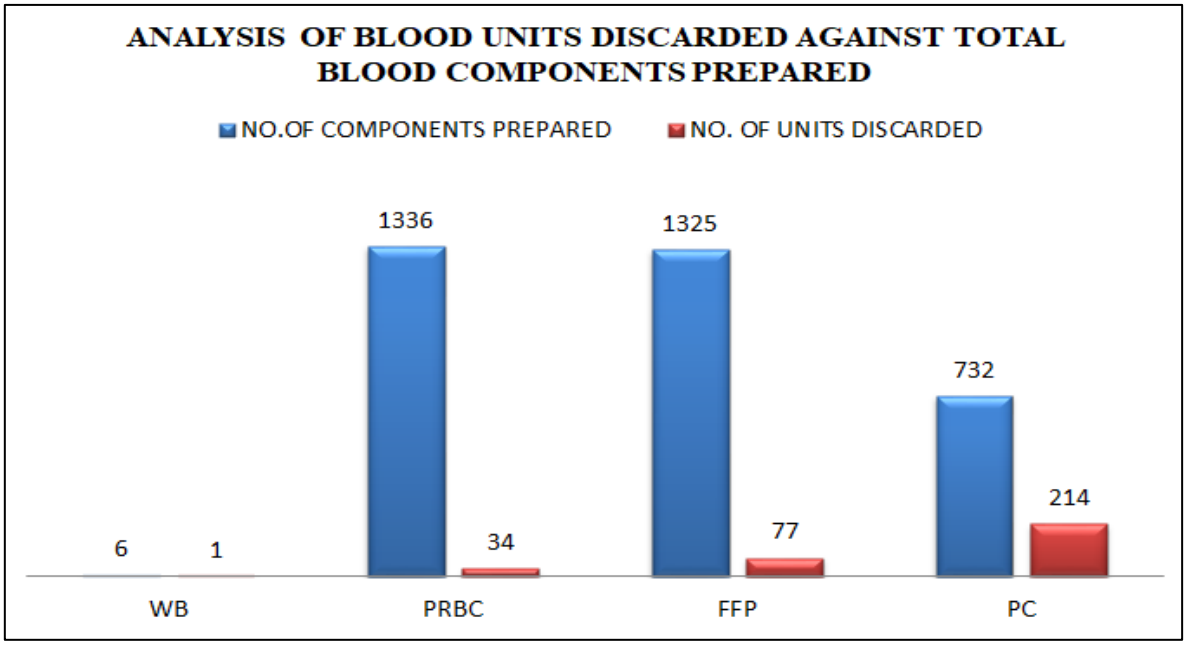

Fig 9 Analysis of Blood Units Discarded Against Total Blood Components Prepared
X-axis Represents Blood & Blood Components
Y-axis Represents Number of Blood and Blood Components Prepared & Discarded

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

- *Analysis of Blood Units Discarded Due to Sero- Positive Infection Positivity*

Table 6 Analysis of Blood Units Discarded Due to Sero- Positive Infection Positivity

SL. NO.	SERO-POSITIVE INFECTION	TOTAL	DISCARD (%)
01	HIV 1 & 2	03	0.92
02	HCV	0	0
03	HBsAg	16	4.90
04	MALARIA	0	0
05	SYPHILIS	06	1.84
	TOTAL	25	7.66

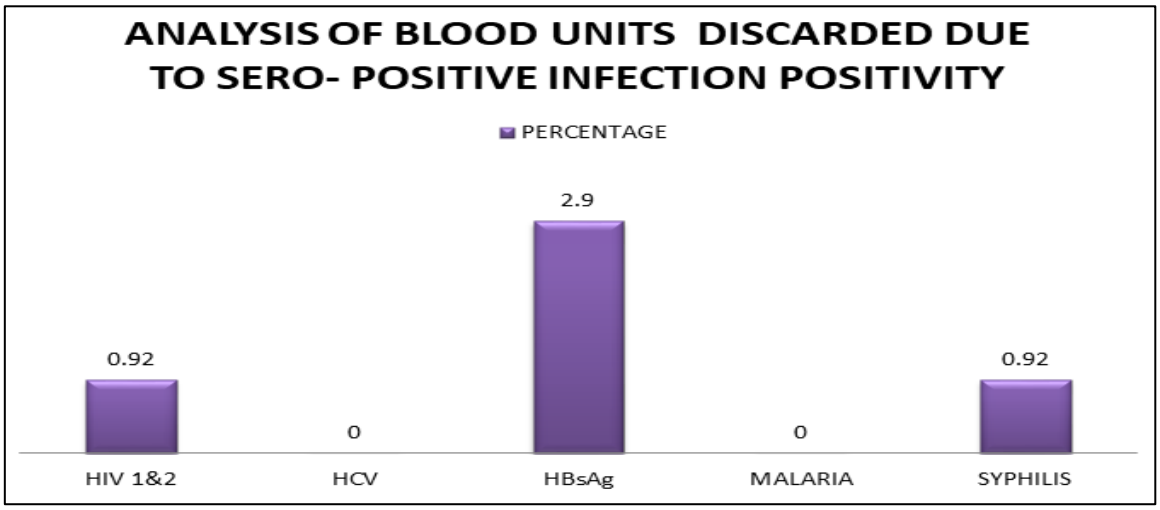

Fig 10 Analysis of Blood Units Discarded Due to Sero-Positive Infection Positivity
X-axis Represents Sero-positive Infections
Y-axis Represents Percentage of Blood & Components Discarded Due to Sero-Positive Infection

- *Analysis of Various Reasons for Discarding Blood and Blood Components*

Table 7 Analysis of Various Reasons for Discarding Blood and Blood Components

BLOOD COMPONENTS	DATE EXPIRED	BREAK	POSITIVE FOR TTIs	LIPEMIC	RBCs CONTAMINATION	LESS QUANTITY
WB	01	-	-	-	-	-
PRBC	20	-	10	-	-	4
FFP	-	48	10	4	02	13
PC	200	-	06	-	02	6
TOTAL	221	48	26	04	04	23

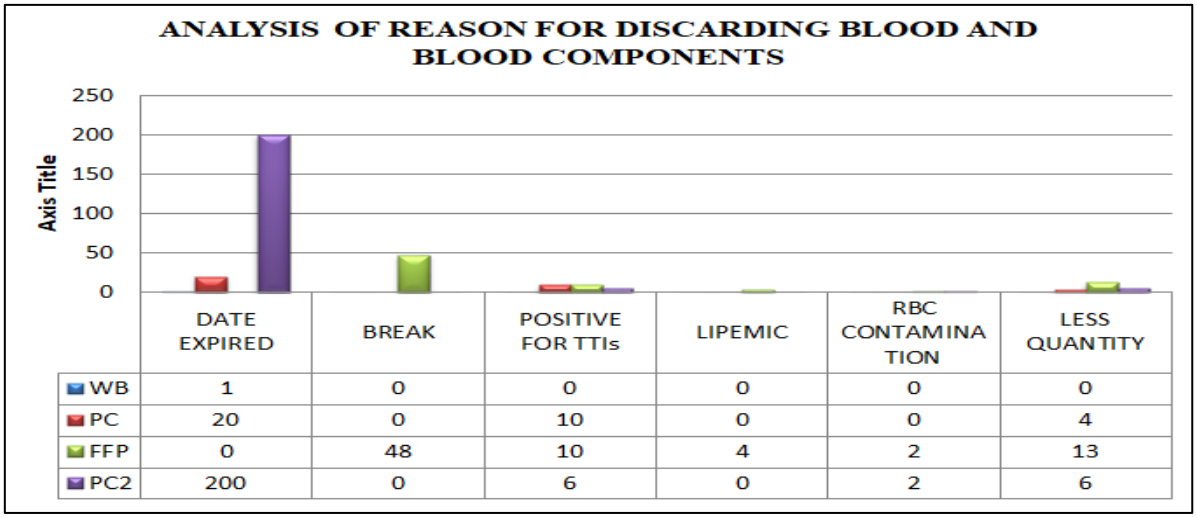

Fig 11 Analysis of Reasons for Discarding Blood and Blood Components

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

CHAPTER FIVE
DISCUSSION

The present prospective observational study was undertaken to evaluate the discard rate of whole blood and blood components and to identify the major factors responsible for their discard at the Blood Centre of Shridevi Institute of Medical Sciences and Research Hospital, Tumakuru. Blood component discard is an important quality indicator that reflects the efficiency of donor selection, component preparation, inventory management, storage practices, and quality assurance within a blood centre.

During the study period, a total of 3,399 blood components were prepared from 1,342 blood donations, of which 326 components were discarded, resulting in an overall discard rate of 9.59%. This discard rate is higher than those reported by Kanani et al. (6.95%), Thakare et al. (3.58%), Morish et al. (2.3%), Kora et al. (4.3%), Suresh et al. (7.0%), Bobde et al. (6.63%), and Sharma et al. (8.69%). However, it is lower than the discard rates documented by Deb et al. (14.61%), Patil et al. (22.45%), and Ghaflez et al. (12.0%). These variations may be attributed to differences in donor profiles, patient load, institutional policies, blood component demand, inventory management practices, and storage facilities across different blood centres.

- *Whole Blood*

Only six units of whole blood were retained during the study period, of which one unit was discarded, resulting in a discard rate of 16.66%. Although this percentage appears comparatively high, it represents a very small absolute number of units. The discarded whole blood unit expired before clinical utilization. Modern transfusion practice emphasizes component therapy rather than whole blood transfusion, resulting in limited indications for whole blood. Therefore, minimizing unnecessary collection of whole blood and promoting timely utilization may further reduce expiry-related losses.

- *Packed Red Blood Cells*

The discard rate for packed red blood cells (PRBCs) was 2.54% (34 of 1,336 units), which is comparable with observations reported in several previous studies. Expiry was identified as the predominant cause of PRBC discard, followed by transfusion-transmitted infection (TTI) positivity and inadequate blood collection. Since PRBCs possess a longer shelf life than platelets, their discard rate remains relatively low. Careful donor screening, accurate donor selection, strict adherence to blood collection procedures, and efficient inventory management can further reduce unnecessary PRBC wastage.

- *Fresh Frozen Plasma*

Fresh frozen plasma demonstrated a discard rate of 5.81% (77 of 1,325 units). Leakage of plasma bags constituted the leading cause of FFP discard, followed by low-volume collection, lipaemic plasma, red cell contamination, and TTI reactivity. Leakage may occur during freezing, transportation, or handling and can be minimized through proper storage techniques, careful handling can reduce the discard rate

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

CHAPTER SIX
CONCLUSION & SUMMARY

➢ *Conclusion*

If these measures are implemented, discard rates can be reduced and utilization of blood and blood components improved:

- Maintaining blood-group–wise records of voluntary donors and avoiding collection from rare-group donors unless needed will allow rapid recall when required.
- Strict adherence to donor selection criteria, proper timing between food intake and donation, and confirming good venous access will lower discards from lipemia and low-volume collections. Thorough predonation history-taking, counseling, and use of software to flag previously screened TTI-positive or suspected professional donors will improve safety. Scheduling donation camps based on current stock levels will reduce excess collections.
- Investigating causes of hemolysis and red cell contamination in PRBC units (for example, temperature control and high hematocrit) and training staff on correct loading of blood bags in centrifuge cups will reduce process-related losses. Because whole blood has limited indications, its collection should be minimized to prevent expiry from non-use; separating donations into PRBC and plasma is often sufficient.
- To avoid wasting platelets where demand is low, prepare platelet units only on request.
- Implementing appropriate transfusion policies, following first-out principles during massive transfusion, using individual stands for FFP to prevent sticking and bag breakage, and networking with nearby blood centres to redistribute near-expiry components will all decrease expiries.
- Finally, promoting regular, voluntary, non-remunerated blood donation will lower the proportion of TTI-positive donations and strengthen the donor pool.
- Conducting regular root-cause analyses of discarded units and addressing identified issues will further reduce wastage and the financial burden while maximizing the availability of this vital resource.

➢ *Summary*

- *Introduction*

Blood is a highly precious fluid containing vital nutrients, oxygen, clotting factors in adequate quantity. Transfusion of blood and its components has a vital role in managing emergency conditions. Human blood is categorized as a ‘Drug’ under section of the Drugs and Cosmetics Act 1940 in India. Many modern surgical procedures could not be carried out without the use of blood and blood components and there is no substitute for human blood. The challenge that each blood centres are facing is to keep sufficient stock to ensure an adequate supply of blood while minimizing losses. Wastage of blood & blood products is an alarming issue. Each unit of blood & its components is precious & must be utilized judiciously with minimal wasting.

- *Aim Of Study*

The present study is designed to analyze reasons for discarding blood bags so that they could be utilized judiciously with minimal wasting and to evaluate the percentage of different reasons of discarded blood & blood products.

- *Materials & Methods*

Data was collected from discard register and confirmed from the master register in Blood Centre at SIMS & RH over the period of 1 year from July 2023 to June 2024.Collected data was entered in Microsoft Excel sheet and was presented in frequency and percentage.

- *Result*

A total number donors from whom whole blood collected during this study period was 1342. Out of which 1336 units were subjected for components preparation. Total 3393 components were prepared. The overall discard rate of blood and blood components was 9.59%. among these 1 (16.66%) whole blood, 34 (2.54%) PRBC, 77 (5.81%) FFP and 214 (29.23%) PC were discarded. The common cause of discarding blood and blood components was due to expiry date 221(67.79%), 48 (14.72%) due to leakage of components, 26 (7.97%) were due to sero- positivity fot TTI, 04 (1.22%) were due to lipeamic, 04 (1.22%) due to RBC contamination and 23 (7.05%) were to low volume collection.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

CHAPTER SEVEN
LIMITATIONS & FUTURESCOPE

Table 8 Limitations & Futurescope

Limitation	Future Scope
This study is not a longitudinal study	This study can done as observational follow up study
Sample were taken from only one blood centre, so results may not apply to other blood centres	Large number of samples can be included in future research
In this study blood bags sent for sterilization were not included	In future sterilization bags can be included
This current study is conducted in a single hospital setting reducing diversity	In future the sample size can be increases and carryout multi-centre/ multi-district,/ multi- State for better representation

➢ *Acknowledgements:*
The author express their gratitude to the study team members & all the participants for their valuable contributions.

➢ *COI:*
The author reports no conflict of interest in this work.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

REFERENCES

[1]. An Action Plan for Blood Safety. National AIDS Control Organization, New Delhi, India ; 2007. http://naco.gov.in
[2]. Kurup R, Anderson A, Boston C, et al. a study on blood product usage and wastage at the public hospital, Guyana. BMC Res Notes 2016;9:307.
[3]. Kanani AN, Vachhani JH, Dholakiya SK, Upadhyay SB. Analysis on discarded of blood and its product with suggested possible strategies to reduce its occurrence in a blood bank of tertiary care hospital in Waetern India Glob J Transfus Med. 2017;2:130-6.
[4]. Thakare MM, Dixit JV, Goel NK: Reasons for discarding blood from blood bank of government medical college, Aurangabad,Asian J Transfus Sci. 2011, 5:59-60.
[5]. Zmijiewski CM, Walter EH, Blood banking Science, New York: Appleton Century Croft;1982.
[6]. Blood transfusion safety. http://www.who.int/bloodsafety/en/Blood_Transfusion_Safety.pdf. Accessed on June 16.2015.
[7]. World Health Organization. Quality System for Blood Safety: Introductory Module Guidelines and Practices. Geneva: WHO;2002. P. 65-75.
[8]. Newman B. Blood donor suitability and donation complications. Handbook of Blood Banking and Transfusion Medicine. 2006. P.27-35.
[9]. Saran RK. Transfusion Medicine Technical Manual. 2nd edition. Drugs Controller General, India. Directorate General of Health Services, Govt of India.2003.
[10]. Sharma N, Kaushik S, Kumar R, Azad Z, Acharya S, Kudesia S. causes of wastage of blood and blood components: a retrospective analysis, IOSR-JDMS 2004;13(12):59-61.
[11]. Patil SB, Vadavadgi AP, Patil BK, Deshmukh SV,. Analysis of causes of discarding blood and its components in a blood bank: A cross sectional study. Perspectives in Medical Research in Medical Research 2021:9(2):6-9.
[12]. Basu D, Kulkarni R. Overview of blood components and their preparation. Indian J Anaesth. 2014;58:529-37.
[13]. Kelly S-L, Reed MJ, Innes CJ, Manson L. A review of blood component usage in a large UK emergency department after implementation of simple measures. Emerg Med J. 2013 ;30:842-5
[14]. Bashir F, Khalid A, Iqbal S, Ghafoor T, Ahmed M. Exploring the Causes of Wastage of Blood and Its Components in a Tertiary Care Hospital Blood Bank. Cureus. 2021 Dec 18;13(12).
[15]. Bobde V, Parate S, Kumbhalkar D. Analysis of discard of whole blood and blood components in government hospital blood bank in central India. J Evid Based Med Healthc2015;2:1215-9.
[16]. Clark JA, Ayoub MM. Blood and component wastage report. A quality assurance functions of the hospital transfusion committee. Transfusion.1989;29:139-142.
[17]. Hardwick J. Blood processing: Introduction to blood transfusion technology. ISBT Sci Ser 2008;3:148-76.
[18]. Mollison P. Historical review. The introduction of citrate as an anticoagulant for transfusion and of glucose as a red cell preservative. *Br J Haematol*. 2000;108:13–18.
[19]. Åkerblom O, Kreuger A. Studies on citrate-phosphate-dextrose (CPD) blood supplemented with adenine. *Vox Sang*. 1975;29:90–100.
[20]. Vogel P. Current problems in blood transfusion. *Bull N Y Acad Med*. 1954;30:657–674.
[21]. James JD. Editorial. Bacterial contamination of preserved blood. *Vox Sang*. 1959;4:177–185.
[22]. Borden CW, Hall WH. Fatal transfusion reactions from massive bacterial contamination of blood. *N Engl J Med*. 1951;245:760–765.
[23]. Walter CW. Invention and development of the blood bag. *Vox Sang*. 1984;47:318–324.
[24]. Simon TL, Snyder EL, Solheim BG, Stowell CP, Strauss RG, Petrides M. editors. Rossi's Principles of Transfusion Medicine. 4th ed. West Sussex, UK: AABB Press-Blackwell Publishing Ltd.; 2009.
[25]. Hans R., Marwaha N. Nucleic acid testing-benefits and constraints.*Asian Journal of Transfusion Science*. 2014;**8**(1):2–3. doi: 10.4103/0973-6247.126679.
[26]. Prugger C, Laperche S, Murphy EL, et al. Screening for transfusion transmissible infections using rapid diagnostic tests in Africa: a potential hazard to blood safety? Vox Sang 2016;110:196-8.
[27]. Pruett CR, Vermeulen M, Zacharias P, et al. The use of rapid diagnostic tests for transfusion infectious screening in Africa: a literature review. Transfus Med Rev 2015;29:35-44.
[28]. Standard Operating Procedures & Regulating Guidelines- Blood Banking. Jaypee Brothers Medical Publications (P) Ltd. 2014. p; 291-293.
[29]. National AIDS Control Organization. Standards for blood banks and blood transfusion services . New Delhi, Ministry of Health and Family Welfare, Government of India. 2007.
[30]. World Health Organization. Quality systems for blood safety: Introductory module guidelines & principles for safe blood transfusion practice. Geneva: World Health Organization; 2002. P.65-75.
[31]. Kora. SA, Kulkarni K. Blood wastage in a blood bankin an analysis of donor rural Karnataka J Clin Diagn Res. 2011;5:1393-6.
[32]. Suresh B, Sreedhar Babu KV, Arun R, Chandramouli P, Jothibhai DS. Reasons for discarding whole blood and its components in a tertiary care teaching hospital blood bank in South India. J Clin Sci Res. 2015:4:213-9.
[33]. Ghaflez MB. Omeir KH, Far JM, Saki N, Maatoghi TJ, Naderpour M. Study of rate and causes of blood components dioscard among Ahwaz's hospital. Sci J Iran Blood Transfus Organ. 2014;11:197-206.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

[34]. Singh P et al. Int J Res Med Sci. 2024 May;12(5):1566-1570.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26jul968

ANNEXURE

SRI SHRIDEVI CHARITABLE TRUST
SHRIDEVI INSTITUTE OF MEDICAL SCIENCES & RESEARCH HOSPITAL, TUMKUR
SCIENTIFIC & RESEARCH COMMITTEE

REF.: SIMS&RH/SRC/2023-2024/65 **Date: 04.08.2023**

To,

Miss Ruksar Sulthana,
Ist Year MSc MLT,
SIMS & RH,
Tumakuru

Dear Miss Ruksar Sulthana,

Ref.: Manuscript Number: SRC2023029

The Scientific & Research Committee has reviewed your proposal titled **"Analysis of reasons for discarding blood and blood components in a blood bank of Tertiary Care Hospital: Prospective Study".**

You are required to submit the final revised copy of the project proposal to the Institutional Ethics Committee within 48 hours of receipt for approval and issue of clearance certificate.

Member Secretary
Scientific & Research Committee

Chairman
Scientific & Research Committee
PRINCIPAL
SHRIDEVI INSTITUTE OF MEDICAL SCIENCES
& RESEARCH HOSPITAL
NH-4, SIRA ROAD, TUMKUR - 572 106.

Copy to,

1. Member Secretary, SMC-IEC, SIMS & RH.