DISCARD OF BLOOD AND BLOOD COMPONENTS WITH STUDY OF CAUSES – A GOOD MANUFACTURE PRACTICE

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ABSTRACT
Background & objectives: Blood transfusion is an essential element in modern healthcare. Blood being an irreplaceable resource needs to be properly utilized with ideally minimal or zero percent wastage. The aim of our study to find out the various causes for discard of blood and blood components so that this can help us in formulating the proper guidelines for proper donor screening, component preparation, optimal usage and training of staffs. Methods: A total of 45,329 units both voluntary and replacement were collected from January 2014 to December 2015 in the Department of Transfusion Medicine, SCB Medical College & Hospital Cuttack. Out of which 27,337 units were collected in single bag and 17,992 units were separated into components. 1264 (1.60%) units' of blood and blood components were discarded during the study period. Results: The study showed discard of 55.11% out of 478 units of whole blood and 58.34% components discard out of 785 units of components due to seropositivity for TTIs. Interpretation: The commonest cause of discard was seropositivity for Transfusion Transmitted Diseases. The platelet concentrates (1.76%) had the highest rate of discard among components. Conclusions: Implementation of proper blood transfusion policy, donor screening and training of technical staffs will help to reduce the discard rate of blood and blood component which ultimately will solve the shortage of these precious elements.

KEYWORDS: blood; blood component; discard; seropositivity; Transfusion Transmitted Infection.

INTRODUCTION
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. The transfusion of blood and blood components has become an integral part of patient management in modern medicine. The requirement of blood is there in every two second. One third of all patients admitted to intensive care units (ICUs) in the developed world receive a blood transfusion. Both the medical and surgical specialists require the steady supply of blood from healthy, caring donors. Since each unit of blood is precious, it has to be utilized properly and judiciously.

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-renumerated, healthy donors. 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. The rate of discard of blood and blood components is one of those quality indicator which is the ratio of blood and blood components discarded to the total number of collection. When the rate of discarded blood is high, the level of efficiency of collection and components preparation process is low.

The aim of our study to find out the various causes for discarding blood and blood components so that this can help us in formulating the proper guidelines for donor screening, component preparation, storage, optimized usage and also training of staffs.

MATERIAL AND METHODS
This is a retrospective study conducted in the Department of Transfusion Medicine, Sri Ram Chandra Bhanja (SCB) Medical Collage and Hospital, Cuttack, Odisha. This study analysed discarded blood and blood components data of SCB blood bank from January 2014 to December 2015. The study included the discard of...
whole blood (WB), and blood components such as Packed Red blood cells (PRBCs), Platelet Concentrates (PC) and Fresh Frozen Plasma (FFP). The parameters for discarding blood and blood products consists of low volume collection, clot formation, breakage/leakage, expired shelf life, hemolysed, lipaemic appearance, RBC contamination and units seropositive for Transfusion Transmitted Infections (TTI). The whole blood was collected and components were prepared as per Drugs & Cosmetic Act, 1940 and Rules 1945. We used Citrate-Phosphate-Dextrose-Adenine (CPDA) anticoagulant blood bag for whole blood collection and Saline-Adenine-Glucose-Mannitol (SAG-M) additive solution as preservative for PRBC. The components were prepared by Platelet rich plasma (PRP) method. The quality of the whole blood and blood components was assessed as per the National Accreditation Board for Hospitals and Healthcare Providers (NABH) Guidelines. All the blood and blood components were subjected to Enzyme-linked immune sorbent assay (ELISA) for TTI screening. Only seronegative products meeting the quality parameters were issued and the rest were discarded. One percentage of individual blood products (WB, PRBC, PC, FFP) were subjected for quality control. The volume and Hematocrit (HCT) were two parameters chosen for quality assessment purpose for whole blood and packed red blood cells, ideally which should be 350/450 ml ± 10% and 245-325 ml and more than 30% and 55-65% respectively. The quality standard for platelet concentrates were volume of 50-70ml, platelet count more than 3.4-4.5 x10^11, pH more than 6 and the RBC contamination not more than 0.5ml. The volume should be 200-220ml and factor VIII, and fibrinogen level of 0.7units /ml and 200-400mg were analysed to meet the good quality for Fresh Frozen plasma.

RESULT

The total number of blood units collected in the study period was 45,329 units, out of which 27,337 units were collected in single bag and 17,992 units were collected in top and top triple bag for preparation of components like PRBC, Platelet Concentrate and FFP.

The overall discard rate of blood and blood component was 1.60 % (1264/ 78929). The rate of discard for Platelet Concentrates of 1.76 % (274/15606) was nearly equal to that of whole blood 1.75 % (479/27,337) and was the highest, where as PRBC was lowest 1.35% (243/15606). The rate of discard of FFP was 1.49% (268 of 17992). [Table-1]

Out of 479 units of whole blood discarded, the seroreactivity due to Transfusion transmitted Infection was the highest (55.11%) followed by poor quality poor of the blood and component (18.58%). The rate of discard for other reasons i.e low volume collection, haemolysed/clotted, breakage, shelf life expired, lipaemia were 17.11%, 3.76%, 2.71%, 1.46%, 1.25% respectively. [Table-2]

The total number of component units discarded during the study period was 785, out of which PRBC units were 243, Platelet Concentrates units were 274 and FFP units were 268. The cause for highest rate (58.4%) of discard was found to be seroreactivity due to TTI. The reason for lowest rate of discard was shelf life expiry (5.2%). The rate of discard for poor quality purpose was 24.0% followed by breakage/leakage of 7.0%. The other (hemolyzed/ lipaemic /RBC contaminated) causes for discard was 5.4%. [Table-3]

* Others = Hemolyzed(H) / Lipaemic (L) / RBC contaminated (c)

The units discarded due to Seroreactivity for whole blood was 264 and blood component was 458. Among seroreactivity units, hepatitis B surface antigen (HBsAg) reactivity was the most common cause. [Table 4 &5]

DISCUSSION

Blood transfusion is an integral part of modern health care. Demand of blood and its components always outpace its supply. This emphasizes the need for proper utilization of blood and its components with preferably “No” or minimal wastage. A total of 45,329 units were collected during the study period at SCB MCH Blood Bank, Cuttack. Out of which 17,992 units were used to prepare blood components (PRBC, FFP, PC).

The present study showed the overall discard rate of blood and blood components to be 1.60% which is lower than the study made by Thakarl et al (3.58%) in India and Morish et al (2.3%) in Kuala Lumpur.

The current study showed that discard of platelet concentrate was highest (1.76%) among the blood components which was lower than the study conducted by Morish et al at Kualalumpur (6%) and also from the multicentre study in European countries from 2000 to 2004. The mean annual discard rate of European countries was 13%. The FFP and PRBC discard rate was 1.35%, 1.49% respectively. The mean PRBC discard was 4.5% which was as par to the discard data from European countries ranging from 0.2% to 7.7%. The Novis study in USA reported that the discard rates of FFP ranged from 2% to 2.5% and RBC ranged from 0.1% to 0.7%. The whole blood discard rate was 1.75% in our center which was lower than the study conducted by Suresh et al 5.7% at Tirupati South india.

The parameters for discard of blood components are seroreactive for TTI, low quality of product as per Drug & Cosmetic Act 1940, low volume collection, expiry due non utilization, breakage/ leakage due to mechanical or
during handing or processing, clotted due to improper mixing of anticoagulant solution and lipemic content due to heavy fatty diet in the product. The reason for discard of blood components due to Seropositivity for TTI was the most common which is similar to study conducted by Gauravi et al.[13] Gujrat, India and Chitina[14] et al at Indore in Choithram Hospital and Research Centre. The present study showed that seropositivity for TTI of Platelet concentrates, FFP, PRBC percentage to be 51.82%, 58.96%, and 65.02% respectively. The overall seropositivity for TTI in our study was 58.34% which is lower than the study conducted by Thakral[15] et al (68.86%). The most common TTI was due to Hepatitis B surface antigen (HBsAg) i.e 58.51% which is comparable to the Sharma N[15] et al and slightly higher than Thakral et al.

All platelets concentrates were prepared by Platelet rich plasma (PRP) method. Platelet and plasma components contaminated with RBC resulted from ineffective separation of platelet-rich plasma (PRP) or plasma from red cells during centrifugation or processing. The present study showed the rate of discard of platelet concentrates due to RBC contamination to be 6.20% where as it was the most common (40%) cause of discard by Morish et al, Kuala Lumpur.[9]

The shelf life of platelet is 5days. So their chance of expiry due to non utilization was highest among blood components. The wastage of platelet can be reduced by preparing it as per the requirement and urgency. In studies conducted by Kumar[16] et al and Deb[17] et al the most common component discarded was platelets due to non-utilization. In our study the discard rate of platelets due to expiry was 10.58%. The rate of discard of PRBC and WB were 4.93%, 1.46% respectively. The storage period of PRBC is 42 days when it contains Saline-Adenine-Gluucose-Mannitol (SAG-M) as a preservative and for Whole blood (WB) it is 35 days at temperature of 2-8°C. The reason for expiry of PRBC and WB was due to failure in proper implementation of first-in-first-out (FIFO). This can be prevented through continuous monitoring and proper implementation of FIFO policy. No FFP was expired during study period. The FFP was stored for one year at -30°C or below. Longer storage period FFP helped us for its proper utilization which was the reason for zero expiry.

Mishandling of blood bags during collection, processing, and storage or manufacturing errors may be the major causes of defects and leakages of blood bags.[18] The integrity of plastic bags is essential and precautions should be taken to prevent leakages.[19] The overall discard rate of blood components was 7.01%. The rate was highest in case of PRBC(10.29%) followed by FFP(7.84%),PC (3.28%).The leakage of PRBC was due to high centrifugal force and FFP was due to thawing process. The discard rate was 26% both in Sharma N et al study and Moris et al Kuala Lampur.

Quality of the product was essential element in blood transfusion service. In present study discard of the blood products was carried out as per the quality criteria laid down in National Accreditation Board for Hospitals and Healthcare Providers (NABH).The discard rate was the second highest due to poor quality of blood and components. The overall discard rate of WB due to quality was 18.58% and the component was 24.08%.

Anticoagulant is a major factor in blood transfusion. Low volume collected units would be unsuitable for transfusion as well as component preparation. So the ratio between volume of blood collection and volume of anticoagulant in blood bag should be corrected.[20] We mostly used Citrate-Phosphate-Dextrose-Adenine (CPDA) anticoagulant blood bags which contain 14ml of anticoagulant solution per each 100ml of blood collection. In our study 17.11% of WB was discarded due to sub optimal volume collection. A South Indian study conducted by Suresh[21] et al showed the discard rate of WB due to suboptimal collection was 9.5%. The reason behind low volume collection of blood included discontinuation of donation because of donor reaction and the blood flow from small vein during phlebotomy. This can be reduced by selection of healthy donor with training and motivation of blood bank staffs.

CONCLUSION

Blood being an irreplaceable resource needs to be properly utilized ideally with minimal or zero percent wastage. The present study concluded that the most common reason for discard was seropositivity for TTI due to Hepatitis B surface antigen(HBsAg) and the highest discard rate was seen with Platelet Concentrates(PC). Our observation is comparable to similar studies conducted in other part of India. Seropositivity for TTI can be reduced by proper counselling of donor following stringent deferral norms. Proper training of phlebotomy staff and Laboratory technicians is required to minimise the wastage of blood which can save many lives.

REFERENCES

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