



(RESEARCH ARTICLE)



Determination of rate, causes and cost of wastage of blood and its products in two blood donation centers in Riyadh

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GSC Advanced Research and Reviews, 2023, 14(01), 055–059

Publication history: Received on 24 November 2022; revised on 07 January 2023; accepted on 10 January 2023

Article DOI: <https://doi.org/10.30574/gscarr.2023.14.1.0015>

Abstract

Background and aims: Wastage of all blood products is an important issue for health providers worldwide. Optimizing blood collection and processing would reduce the rate of wastage and improve the efficiency of the blood transfusion services. The aim of this study is to determine the rate of wastage of blood and blood components and identify its reasons at two hospitals in Riyadh.

Method: A retrospective study was conducted on the data retrieved from the blood donation centers records on production and wastage of blood products during the period from November 2016 to October 2017 at two hospitals in Riyadh. The data were analyzed with MS Excel and SPSS 20.

Results: A total of 3220 units of whole blood were collected in both hospitals during the study period. The most prepared blood component in both hospitals was packed red blood cells (PRBCs) 96.9%, followed by fresh frozen plasma (FFP) 58.66%, and platelets (PC) 52.67%. The wastage rates for safe blood components during the study period were 3.75% for PRBCs, 6.62% for FFP, and 75.8% for Platelets. The highest wastage rate of safe blood components was for Platelets (75.8%). The major reason for that high rate was delay in getting the results of transfusion transmitted infection (TTI) tests and some units were expired before released to the blood bank. The total cost for blood wastage was 262,828.3£ (1,201,125.33 SAR).

Conclusion: This study reported the highest wastage rate for all 3 blood components in comparison with other similar studies which urge the need to take an action to reduce these occurrences.

Keywords: Blood products; Donor; Wastage; Cost

1. Introduction

Transfusion of blood and blood products plays an integral part of patient management. One of the major challenges that facing any blood transfusion services (BTS) is to supply enough amount of safe blood whenever it needs^{1,2}. In many countries the need for blood surpasses the blood supply. Data from World Health Organization (WHO) showed that 87.5% of developing countries collect less than 50% of their blood needs³. In Saudi we do not have a clear (unbiased) date about blood supply to demand ratio and the rate of wastage. Due to absence of official body for blood transfusion services and the transfusion services are mainly in the form of hospital based blood bank. But from our experience, we assume that the situation in Saudi Arabia like other developing countries in the way that the collected blood covers less than half of the country need. Therefore, the collected blood needs to be handled with caution, utilized appropriately and the waste needs to be decreased or eliminated.

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There are many factors contributed to the shortage in blood supply and the wastage, including deficient donor recruitment plans, inappropriate blood collection and components processing, and poor stock management and transportation⁴. According to WHO most of the above mentioned factors are responsible for the loss of around five million blood units every year⁵.

This study was done to detect the various reasons for donor blood wastage in Saudi MOH hospitals and suggest some correction measures.

2. Material and methods

This is a retrospective cross-sectional study, data about the amount of collected blood each month, number of prepared units of blood and its component, number of discarded units, and reason for the discard was collected directly from the participated hospitals via reviewing blood donor centers records in the period from November 2016 to October 2017. The participated hospitals were two, one is a general hospital (GH) with a capacity of 150 to 200 beds and the other is a specialized hospital (SH) with a capacity of 350 to 400 beds. Both hospitals in Riyadh and for both the tests for TTI are done in Central Blood bank screening laboratory.

Wastage rates were calculated using the following formulas:

- Wastage rate for any blood components = (Number of units which were discarded / Total number of prepared units) X 100.
- Wastage rate for any safe blood components = (Number of TTI negative units which were discarded / Total number of prepared TTI negative units) X 100.

To calculate the cost of wasted blood products and because we don't have a local price list, United Kingdom NHS blood and components price list 2016/17 was used as reference in spite of the presence of some differences in the way of doing TTI tests between the two countries.

The collected data were first entered in MS Excel and later analyzed using SPSS version 20.

3. Results

3.1. Blood and blood components collected during the study period

A total of 3220 units of whole blood were collected in both hospitals during the period from November 2016 to October 2017. Mean blood unit (\pm SE) collected each month during the study period were 144.5 ± 43.86 for SH and 115.42 ± 50.4 for GH. The most prepared blood component for both hospitals was packed red blood cells (PRBCs) 96.9%, followed by fresh frozen plasma (FFP) 58.66%, and platelets (PC) 52.67%. Table 1 shows the amount of blood components collected during the study period for each hospital.

Table 1 Amount of blood components prepared during the study period for each hospital

Blood component	SH No. Units	GH No. Units	total
PRBCs	1734	1385	3119
FFP	859	1030	1889
PC	851	845	1696
Cryoprecipitate	0	0	0

3.2. Blood wastage during the study period

The wastage rates were 15.59%, 24.6%, and 76.2% for PRBCs, FFP, and PC respectively. The wastage rates for safe blood components were 3.75% for PRBCs, 6.62% for FFP, and 75.8% for PC. Figure 1 demonstrated the wastage rates for safe blood at each hospital during the study period.

3.3. Reasons for blood wastage

The highest wastage rate for safe blood components was for PC (75.8%). The major reason for that high rate was delay in getting TTI tests results. The other reasons for safe blood wastage include broken bag, clotted blood, or showed signs of abnormal appearance such as underweight, overweight, and plasma/ platelets with high RBCs contamination. Table 2 shows the causes for safe blood wastage during the study period.

Table 2 Reasons for safe blood and blood components wastage

Reason for blood wastage	% of total safe blood
Broken bag	0.71%
Clotted blood	1.22%
Underweight	0.93%
Overweight	0.64%
Expired unit* (all are platelets)	45.2%
Red cell contamination	1.2%

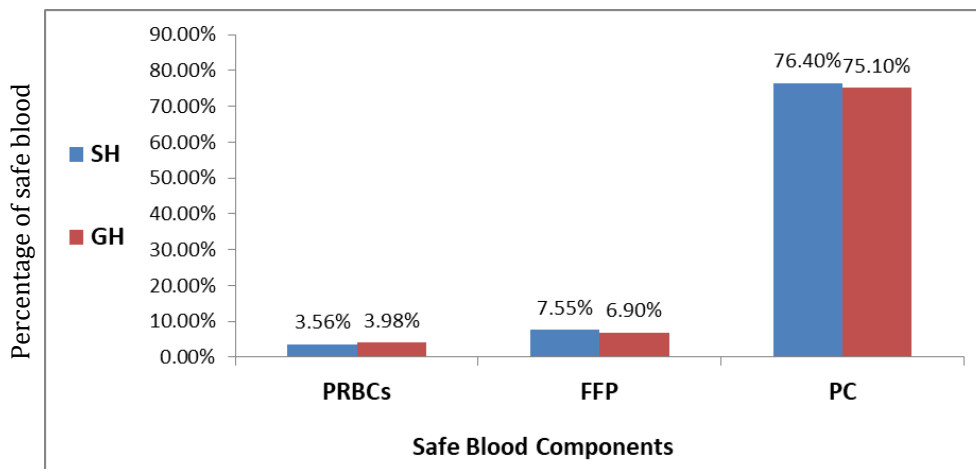


Figure 1 Wastage rates for safe blood components

3.4. The cost of blood wastage

The production cost according to United Kingdom NHS blood and components price list for year 2016/17 for one unit of PRBCs, FFP, and PC is 102£, 28.45£, and 193£ respectively. During the study period the wastage of safe blood component was 101 units of PRBCs, 125 units of FFP, and 1296 units of PC with a total cost of 262,828.3£ (1,201,125.33 SAR) in only 2 hospitals in the heart of Riyadh and for one-year observation.

4. Discussion

This study attempts to analyze the wastage at two of MOH hospitals in Riyadh during the period from November 2016 to October 2017. A close review of the collected blood would help to focus on the areas of frequent wastage and understand the main cause for blood wastage. This would further help to design intervention programs or measures to prevent such wastage and also increase the awareness for wastage issue throughout MOH hospitals in general.

Of the three blood components prepared by the participated hospitals, packed red blood cells (PRBCs) were the most frequently prepared (96.9%) followed by fresh frozen plasma (FFP) (58.66%) and Platelet (52.7%). Because of high demand, PRBCs were the most prepared blood component in other studies ^{6,7} as well. Platelet was the least prepared component in this study, which contradicted the results of other similar ^{6,8} studies where cryoprecipitate or whole blood were the least prepared products. That contradiction might be due to that most of MOH hospitals at the time of the study

have stopped using whole blood for transfusion and for quality issues cryoprecipitate preparation was stopped. The causes for platelet being the least prepared component in this study could not be found via reviewing the blood donation records. However, after interviewing the staff in both centers, the main causes were a shortage of staff together with short working time. That means for around 40% of the collected blood in both centers only PRBCs were prepared and platelet rich plasma (PRP) were discarded (hidden wastage) without taking the need for FFP and platelet in the account. Because of lack of records for that hidden wastage, it was not included in the calculation of the wastage rate in this study.

Table 3 Comparison of Platelet wastage rate obtained in previous similar studies

Study by	Wastage rate	Main reason for wastage
Roy & Pal 2015 ¹¹	32.35%	Expired (at hospital blood bank)
Mohebbi Far et al 2013 ⁷	16%	Expired (at hospital blood bank)
Morish et al 2012 ¹²	6%	Platelet units was contaminated with > 2 ml of RBCs
Current study	75.8%	Expired (at blood donation centre before released to blood bank)

This study also showed that over one-year period, the wastage rates for safe blood components were 3.75% for PRBCs, 6.62% for FFP, and 75.8% for PC. The wastage rate for PRBCs in the current study was higher than Novis study where the overall wastage rate of PRBCs (donation center + hospital blood bank) was ranged from 0.1% to 0.7% ^{9,10}. The major cause for the high PRBCs wastage rate in this study was clotted blood, which can be due to lack of phlebotomy technique training, low flow rate, inappropriate blood to anticoagulant ratio, poor mixing, defect in anticoagulant or defect in the bag.

The wastage rate for FFP in Novis study was 2% to 2.5% ^{9,10} compared to 6.62% in this study. That high rate was mainly due to plasma contamination with RBC as a result of ineffective separation of plasma from red cells during centrifugation or processing due to human or centrifuges factors. Platelet concentrates scored the highest at 75.8% when compared with the other blood components. The reasons behind that high rate was mainly because the platelet units reached their expiry date before the release of TTI results from Central Blood Bank Lab. As compared with other similar studies shown in Table3, it was observed that higher rate of platelet concentrates wastage was shown by this study.

Despite the increasing cost for producing safe blood globally, the wastage in MOH hospitals is high according to the current study, which in terms of money estimated to be 1,201,125.33 SAR (262,828.3£) in only 2 hospitals for only one year observation. More than 80% of that wastage was Platelet concentrates. Bearing in mind that the above mention cost was according to United Kingdom NHS blood and components price list 2016/17 where the nuclear acid test (NAT) for hepatitis B & C and HIV are done as a mini-pool of 6 donor samples while in Saudi MOH hospitals, it is done as individual test (ID-NAT) which increase the production cost and makes the estimated cost for wasted blood higher than the above mentioned value.

- The current study recommends the following steps to reduce the wastage of blood and blood products:
- Develop and Implement targets for blood and blood product wastage.
- Develop an education and training framework to ensure better blood collection and processing.
- Better distribution of manpower and machines according to the workload.

Enhance the awareness of the cost of blood and blood products through:

- Incorporation of individual unit price in all blood bank reports.
- Additional of a price label on all blood products units.
- Before the two mentioned points above the MOH needs to develop a national price list for blood and blood products.
- Improve the collection, analysis, and distribution of data relating to blood and blood product discards.

This study is retrospective, which means only information available in the records was collected for the study. Due to this limitation it was not possible to determine the rate and cost for hidden wastage.

5. Conclusion

This study reported the highest wastage rate for all 3 blood components in comparison with other similar studies which urge the need to take an action to reduce these occurrences.

Compliance with ethical standards

Acknowledgments

I would like to express my special thanks of gratitude to my colleagues in MOH

Disclosure of conflict of interest

I confirm that neither I nor any of co-authors have any conflict of interest to disclose.

References

- [1] World Health Organization WHO. (2002). Quality system for blood safety: Introductory module guidelines and principles for safe blood transfusion practice Geneva. 65-75.
- [2] Custer B, Johnson E, Sullivan SD, et al. (2005). Community blood supply model: Development of a new model to assess the safety, sufficiency, and cost of blood supply. *Med Decis Making*. 25: 571-582
- [3] World Health Organization WHO. (2010). Availability, safety and quality of blood products. Report by the Secretariat. Sixty third world health assembly A63/20 provisional agenda item 11.17.
- [4] Bugge HF, Karlsen NC, Oydna E, et al. (2013). A study of blood transfusion services at a district hospital in Malawi. *Vox Sang*. 104: 37-45.
- [5] World Health Organization WHO. (2009). Availability, safety and quality of blood products. Executive Board. EB 125/5.
- [6] Kurup R, Anderson A, Boston C, et al. (2016). A study on blood product usage and wastage at the public hospital, Guyana. *BMC Research Notes*. 9: 307-312.
- [7] Mohebbi R, Samiee F, Abdolazimi Z, et al. (2014). Determination of rate and causes of wastage of blood and blood products in Iranian hospitals. *Turk J Hematol*. 31: 161-167.
- [8] Veihola M, Aroviita P, Kekomäki R, et al. (2007). Discarded cellular components and the technical efficiency of component preparation. *Eur J Health Econ*. 9: 325-331.
- [9] Novis DA, Renner S, Friedberg R, et al. (2002). Quality indicator of fresh frozen plasma and platelet utilization three college of American pathologists Q-probes studies of 8981796 units of fresh frozen plasma and platelets in 1639 hospitals. *Arch Pathol Lab Med*. 126: 527-531.
- [10] Novis DA, Renner S, Friedberg R, et al. (2002). Quality indicator of blood utilization three college of American pathologists Q-probes studies of 12288404 red cell units in 1639 hospitals. *Arch Pathol Lab Med*. 126: 150-156.
- [11] Roy A & Pal A. (2015). Evaluation of wastage rate of blood and components- An important quality indicator in blood banks.
- [12] Morish M, Ayob Y, Salman H, et al.(2012). Quality indicators for discarding blood in the national center, Kuala Lumpur. *Asian J transfusion Sci*. 6(1): 19-23.