

Original Research Article

Wastage of rarest blood and blood components can be stopped: 9 years retrospective and cross-sectional study at tertiary hospital

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ABSTRACT

Background: Inventory of blood/blood components suffer due to outdating of Rh Negative units. Rationale of this article is strategy of transfusion of O Rh Negative red cells to all. A Rh Negative red cells can be given to A Rh Positive, AB Rh Positive. B Rh Negative red cells can be given to B Rh Positive, AB Rh Positive. AB Rh Negative red cells to AB Rh Positive recipients. AB Rh Negative FFP/PRP can be given to all. Objective was to avoid out dating of Rh Negatives by studying the percentage of outdated Rh Negative units amongst the all outdated.

Methods: This was 9 years observational, retrospective, cross sectional and descriptive study conducted at tertiary care hospital. Outdated units of Rh Negative blood and components were analysed from the year wise discard registers of blood bank. Percentage of Rh Negative units within all outdated units were calculated.

Results: 198 Rh Negative units of whole blood and blood components within all outdated units was 29.11%. Out of 198 the 20 Rh Negative blood components were discarded.

Conclusions: Adopt type and screen protocol to prevent outdating. Avoid to bleed the rare blood groups. Audit by hospital transfusion committee and implementation of MSBOS. Track O Rh Negative red cells transfusion to Rh Positive as quality indicator. Track/review transfusion of O Rh negative red cells to Non O Rh negative recipients. Track AB Rh Negative FFP/PRP transfusions to all.

Keywords: Rh Negative, Tracking

INTRODUCTION

Government Medical College and Hospital Blood Bank Akola from central India is licensed since 30 years and the problem of maintaining the inventory of blood and blood components is still existing due to increased requirement of blood and components day by day due to expansion and upgrading to a state owned medical college and hospital where catering population is also expanded to nearby states. In such scenario the wastage of blood due to out dating particularly Rh Negative units is remarkable. The increased requirement can be coped with avoiding the outdating of Rh Negative blood and

components and transfusion of these units to Rh positive recipients.

There are 22 blood group systems including ABO, Rh and Kell blood groups which contain antigen that can provoke the most common transfusion reactions. Blood group O population is most common worldwide followed by group A, group B is less common and group AB is least common.

The Rh group is one of the most complex blood groups known in humans. From its discovery 65 years ago, it has become second in importance only to ABO blood group in the field of transfusion medicine.

The antigens of Rh blood group are proteins. Some people have version of gene that does not produce D antigen and therefore the RhD protein is absent from their red blood cells. To date 49 Rh antigens are known.

The significance of Rh blood group is related to fact that the Rh antigens are highly immunogenic. In the cases of D antigen individual who do not produce the D antigen will produce anti D if they encounter the D antigen on transfused RBC, causing haemolytic transfusion reaction or on the foetal RBC, causing haemolytic disease of new born for this reason the Rh status is routinely determined in the blood donors, transfusion recipients and in mothers to be.

Percentage of general population in O Negatives is 6.5%, A Negative is 5.7%, B Negative is 1.7% and AB Negative is 0.7 %. Antibodies produced against Rh antigen is mainly IgG, some IgM. Antibody reactivity is capable of haemolysis. Rh antibodies rarely activate complement. They bind to RBC and mark them up for destruction in the spleen. Transfusion reaction is typically delayed haemolytic transfusion reaction.¹

The highest percentage of people with Rh Negative blood is found in the Atlas mountains of Morocco is 40%. The next highest are the Basques. Rh Negative rate is seen in those with ancestral roots in Basque Provinces in Spain and France have a highest incidence of Rh Negative blood than others around world. 27% Basques have type O Rh Negative blood.^{2,3}

Best use of O Negative red blood cells in trauma and massive transfusion settings where uncross matched type O blood may be given before a valid ABO and Rh type is available. Rh blood group system has several clinically significant antigens. Transfusion practices and management of O Rh Negative red cell units should be reviewed and adopted by each hospital's blood transfusion, utilization and review committee.

Canadian blood services adopted new policy for best practices for use of O Rh Negative red cells to ensure their availability for patients for whom there is no alternative. Canada is having 6-7% of general population of O Negative. O Rh Negative collections are not always adequate to meet O Rh Negative red cells demand.⁴

Each hospital is having blood transfusion, utilization and review committee which includes transfusion specialist, pathologist, blood bank officer, clinician, surgeon, public relation officer and hospital administrator, regular audit of blood transfusion and its components is essential by this committee to reduce the blood wastage and to promote rational use of blood.⁵

Rationale of this article was based on the universal strategy of O Rh Negative whole blood and red blood cells can be given to all blood types. A Rh Negative can be given to A Rh Negative, A Rh Positive, AB Rh

Negative, AB Rh Positive recipients. B Rh Negative can be given to B Rh Negative, B Rh Positive, AB Rh Positive recipients, AB Rh Negative. AB Rh Negative can be given to AB Rh Negative and AB Rh Positive recipients.⁶

All types of red blood cells (RBC) can receive O Negative blood and all types of platelets and plasma can receive components from AB Rh Positive and AB Rh Negative donors.^{6,7} The myth or phobia of avoiding transfusion of Rh Negative units to Rh Positive recipients is in existence amongst the treating physicians.

Data of outdated rare Rh Negative group units discard due to outdated is alarming and this will definitely prove that we can prevent the wastage of such prestigious blood or blood components by following the guidelines as stated in the policy of Colorado's community blood centres and Canadian blood service strategy to introduce the T and S till the report comes from laboratory. The O Rh Negative blood can be transfused in emergency, after receiving the report of T and S then the group specific blood can be transfused.

Objective was to study rare, rarer and rarest blood and blood components of Rh Negative units, wastage can be prevented by avoiding the out dating of units by studying the percentage of outdated units of Rh Negative units amongst the total outdated blood and blood components.

METHODS

This is an observational, retrospective, cross sectional and descriptive study done at Government Medical College and Hospital, Blood Bank, Akola for the period of 9 years from year 2009 to 2017.

Outdated units of blood and blood components is accounted from the year wise discard registers maintained in the blood bank. The basic reason for non-utilization for some units was not only the outdated itself but the other major reason was Rh Negative blood discard as Rh Negative recipients were not available at that time during their shelf life and hence after outdated these units were discarded.

The data of outdated units of blood and blood components is accounted. Within this collected data the Rh Negative units were also accounted.

The percentage of 9 years Rh Negative discarded units of blood and components within the entire outdated discarded units in same duration is calculated. This calculated data will be compared with other study and the calculated data is analysed.

Included variables are year wise data for analysis purposes and groupings of outdated discarded units and Rh Negative discarded units were chosen. The data of Rh

Negative discarded units were highly precious so this data is chosen for analysis.

Statistical Methods

Calculation of percentage of discarded Rh Negative units out of all discarded outdated units of blood and components. There is no missing data and analysed data don't have any sensitivity analyses.

RESULTS

The year wise outdated units and the outdated Rh Negative units are plotted and the variation of Rh Negative discard is seen varying from 11 units to 43 units and overall percentage of Rh Negative units among all the outdated and discarded units in 9 years is 29.11% (198 units) and this value is more significant as it is almost one third of all outdated units (Table 1). Subgroups of Rh Negative discarded units, out of 198 Rh Negative discarded units the maximum are the 64 units of O Rh Negative units, these Red cell units and whole blood units could have been utilized for all recipients of all blood groups and Rh types including Rh Positive red blood cells and whole blood units.

The next subgroup includes B Rh Negative 54 units, these units of Red Blood Cells and Whole Blood could be used for the recipients of B Rh Positive and AB Rh Positive also.

Next subgroup of wastage is A Rh Negative 40 units of Red Blood Cells and Whole Blood, these could be utilized for A Rh positive individuals and AB Positive individuals.

Table 1: Year wise outdated blood and components discard.

Year	Outdated	Rh Negative	Overall
2009	29	11	29.11%
2010	42	19	
2011	65	15	
2012	39	14	
2013	70	29	
2014	96	22	
2015	76	18	
2016	127	27	
2017	136	43	
Total	680	198	

Table 2: Group wise Rh Negative blood and components discarded.

Year	A Negative	B Negative	AB Negative	O Negative	Total Negative
2009	2	2	4	3	11
2010	6	3	6	4	19
2011	2	9	2	2	15
2012	3	3	4	4	14
2013	4	4	5	16	29
2014	2	1	7	12	22
2015	4	5	4	5	18
2016	7	5	5	10	27
2017	10	22	3	8	43
Total	40	54	40	64	198

AB Rh Negative 40 units of red blood cells and whole blood were discarded as these units were highly rarest and most prestigious one and those can be used for AB Rh Positive individual's also.⁶

Maximum outdated discard is observed in 2017 of B Rh Negative red blood cells and whole blood units and is followed by discard in year 2013 of O Rh Negative red blood cells and whole blood units (Table 2).

The year wise Rh Negative blood component units of RBC, FFP and PRP discarded in the period of 9 years is

analysed. In first 4 years and last one year shows no discarding of Rh Negative blood components. The remaining 4 years from 2013 to 2016 show total 20 (10.1%) Rh Negative components were discarded out of discard of all 198 units of Rh Negative units of whole blood and blood components (Table 3).

Out of these 20 units of Rh Negative components, the 2 units of AB Rh Negative fresh frozen plasma were discarded after outdated. This rarest component could have been used for any individual of any group and any Rh type who requires fresh frozen plasma.

Table 3: Year wise Rh Negative outdated blood components discarded.

Year	RBC	Out of all Rh Negative outdated	FFP	Out of all Rh Negative outdated	PRP	Out of all Rh Negative outdated	Total	Out of all Rh Negative outdated
2009	0		0		0		0	
2010	0		0		0		0	
2011	0		0		0		0	
2012	0		0		0		0	
2013	1		1		1		3	
2014	3		2		4		9	
2015	0		1		4		5	
2016	1		0		2		3	
2017	0		0		0		0	
Total	5	2.52%	4	2.02%	11	5.56%	20	10.10%

DISCUSSION

In this study (Table 2) group wise Rh Negative blood with components shows the maximum wastage of O Rh Negative percentage amongst all Rh Negative wastage is about one third (32.32%), these units could be utilised in the settings of trauma centre where there is no time to wait for the results of typing of blood grouping and screening for atypical antibodies. Uncross matched blood of O group and Rh Negative can be used in emergency.

The issue of uncross matched blood is existing in Colorado and Canada. Colorado's blood centre policy suggests:

- Females' age under 50 years age should receive O Negative blood until the ABO Rh type is determined.
- Males' age under 18 years age should receive O Negative blood until the ABO Rh type is determined.
- All others patients should receive O Positive blood until the ABO Rh type is determined.⁴

A Canadian policy suggests-appropriate use of Rh Negative red cells. Mandatory indications for O Rh Negative red cells should be always used for:

- Rh Negative females of child bearing age.
- Rh Negative males and females with anti D.
- Emergency use for females less than 45 years of age when blood group is unknown.
- Intrauterine transfusions (intravascular and intraperitoneal transfusions).

Highly recommended indications are:

- O Rh Negative of any age where chronic transfusions (haemoglobinopathies).
- Chronic transfusion requirements.

Generally acceptable indications are:

- Rh Negative males requiring non massive transfusion.
- Rh Negative females older than 45 years requiring non massive transfusions.
- Non O Rh Negative infants less than 1 year of age when group specific units are not available.
- Non O Rh Negative requiring phenotypically matched antigen or antigen negative units when group specific units unavailable.

Best practices are:

- Change to group specific units immediately when the patients ABO group is determined.
- Ensure that emergency use of Rh Negative red cells is reviewed by hospital transfusion committee.
- Review hospital outdate rates of O Rh Negative red cells and transfusion of older Rh Negative red cells to Non O Rh Negative to avoid unit outdating.
- Review O Rh Negative stock compared to all group should not be greater than 10%. Implement policies for optimal inventory management.
- Have a policy to switch patients to their own blood group once determined.
- Have a policy for switching known haemorrhaging O Rh Negative patients to O Rh Positive red cells unless known to have anti D.
- Always request group specific units for patients with red cell antibodies only, use Rh Negative substitutions if group specific is not available for scheduled transfusion date.
- Reduce cross matched inventory by implementing MSBOS and cancel after 24 hours of surgery (exception patients with red cell antibodies).
- Share inventory between affiliated hospital sites to ensure appropriate use and prevent outdating.

Track O Rh negative red cell transfusion to Rh positive patient as a quality indicator.

- Monitor soon to outdate O Rh Negative cells only as a last resort transfusion to non O Rh Negative patient to avoid wastage and redistribute to larger nearby hospitals.
- Track and review redistribution data and data about transfusion of O Rh Negative red cell to Non O Rh Negative patients to avoid expiry.⁴

In this study (Table 1) year wise outdated blood and components shows the overall percentage of Rh Negative units among all the outdated units for 9 years (2009-17) was 29.11%. While a study by Kora SA and Kulkarni K of SN Medical College and HSK Hospital Bagalkot in southern India shows that teaching institute has discarded 38 units of outdated blood out of which 10 units (26.32%) were Rh Negative blood units. The data of present study of Rh Negative wastage is somewhat equal and comparable for present teaching institute.⁴

Study in southern India recommends to follow Type and Screen protocol, this protocol includes the screening for other antigens apart from routine ABO and Rh typing like ABO (A1 and A2), Rh (e and c), Bombay, Para Bombay, MNS and Kell, Lewis, Duffy and autoantibodies. Another recommendation was not to bleed the rare blood groups like Rh Negative donors until required and the last recommendation was for performing the regular audit by hospital transfusion committee.⁵

Maximum B Rh Negative outdated units have been discarded in the year 2017, actually the proportion of population of B Negative is 1.7% so how this phenotype is rare and we have lost 54 units in 9 years, so it could be utilized for B Rh Positive and AB Rh Positive recipients and in this region there is always a shortage of B Rh Positive blood and components for group specific transfusion.⁶

Similarly, authors lost 40 units of each A Rh Negative and AB Rh Negative units where actually the 5.7 and 0.7 % of population respectively. A Rh Negatives could have been used for A Rh Positive and AB Rh Positives similarly AB Negatives could have been used for AB Rh Positives and this is the rarest units in the world.⁶

In this study (Table 3) year wise Rh Negative outdated blood components discard is 10.1%. The outdated of Rh Negative components were existing in the mid portion of study from 2013 to 2016 (4 years) and peak wastage was in the year of 2014.

RBC where 2.56 % of all outdated negatives in which O Rh Negative red blood cells could be given to any blood group and Rh type in the emergency.

The maximum outdated is of PRP component which is 5.56% of total outdated Rh Negative outdated discard. The reason is very clear that this component is having the very less shelf life to store at 22 degree centigrade for 3 days.

The last category of FFP components also needs attention, the shelf life of this component is one year, and the wastage of this component is minimum 2.02 % and 2 units of AB Rh Negatives FFP were discarded due to outdated. The all recipients who require FFP can receive from AB Rh Positive and AB Rh Negative donors.^{6,7}

The policy of AB Positive and AB Negative FFP and PRP can be transfused to all recipients to whom it is indicated, this policy is to be decided by hospital transfusion committee to avoid the wastage Rh Negative FFP and PRP.

There was sharp drop in blood outdated since implementation of Type and Screen crossmatch protocol, the outdated rate was reduced from 11.5% to 1.3% for whole blood, from 4.95 from to 0.4% for red cells.⁸

Blood bank personnel can convince surgeons to change their pre surgical blood orders from type and cross match to type and hold approach. To do this it is necessary to guarantee blood availability within a short time frame if blood should be unexpectedly required. Such change in blood orders significantly reduced the number of unnecessary cross matches and amount of wasted outdated blood.⁹

CONCLUSION

Around 9 years percentage of Rh Negative units within outdated units was 29.11%. Outdating could be avoided by adopting type and screen protocol, avoiding to bleed the rare blood groups, regular audit by Hospital Transfusion Committee and implementation of MSBOS. Track O Rh negative red cells transfusion to Rh positive as a quality indicator. Track/review transfusion of O Rh negative red cells to Non O Rh negative recipients and track AB Rh Negative FFP/PRP transfusions to avoid out dating.

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