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Study of Quality Indicators in Blood Transfusion Services in Tertiary Care Hospital of North India

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Abstract
Background
Blood transfusion has become an essential part of patient management in modern medicine. Monitoring of such indicators should be done regularly, and deficiencies are to be corrected for effective blood transfusion services.
Aim:- the study was carried out to measure the impact of monitoring of quality indicators and how it can be used as a tool for Continuous Quality Improvement (CQI).
Material and Methods
Thisone-year prospective study was conducted in Department of Transfusion Medicine, Government Medical College and Rajindra Hospital, Patiala for the period of January 2018 to December 2018. The data was calculated for seven quality indicators which were defined by National Accreditation Board for Hospitals and health care providers (NABH).
Results
After the yearly data evaluation,adverse donor reactionrate(ADR) was found to be 1.59%, donor deferral rate (DDR) was 10.36 %, Transfusion transmitted infection% (TTI) was 1.4 %, Component Quality Control (QC) Failure Rate was 15.5%. The overall component QC failure rate of platelet concentrates (PC)was 18.18%, 21% in packed red blood cell (PRBC), 11.57% in fresh frozen plasma (FFP), and 0% in each of cryoprecipitates (CP) and single donor platelets (SDP) included whole blood. Adverse transfusion reaction rate (ATTR) was 0.16 %, percentage of components issued was 99.67% and net wastage rate was 12.09% with wastage rate of whole blood PRBC, PC, FFP, CP, CPP was 43.97%,1.98%, 43.37%, 5.91 %, 26.3%, 2.74% respectively.
Conclusion
Quality indicators are important tool and requirescontinuous monitoring for the better utilization of the blood transfusion services. The establishment of a quality system ensure the collection of adequate supplies of blood from regular, voluntary non-remunerated donors, the testing of all blood before use and the appropriate clinical use of blood.

Keywords
Quality indicators, adverse donor reaction rate, donor deferral rate, transfusion transmitted infection, component quality control failure rate, adverse transfusion reaction rate, wastage rate.

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I. Background

The transfusion of blood or blood components is one of the most significant part of delivery of healthcare services in a hospital setting. [1] The American Association of Blood Banks (AABB) defined quality indicators as the specific performance measurements designed to monitor 2 one or more processes during a defined time and are useful for evaluating service demands, production, adequacy of personnel, inventory control and process stability.[2]A well-structured blood transfusion service contributes towards a better healthcare in a hospital, which is reflected by quality indicators.[3] Each blood component is used for different indication; thus, the component separation has increased the utility of one WB unit. Advance in medical technology demands more and more provision of safe blood for the effective management of patients.[4]Studies claim that through target interventions and adherence to strict guidelines, a significant reduction in the wastage of blood components could be achieved and maintained.[5-7]

II. Material And Methods

This one year prospective study was conducted in Department of Transfusion Medicine, Government Medical College and Rajindra Hospital, Patiala for the period of January 2018 to December 2018.
The data was calculated for seven quality indicators which were defined by NABH.[8]
1. Adverse donor reaction rate %

2. Donor Deferral rate %
3. Transfusion transmissible infections % (TTI %)
4. Component Quality Control (QC) failure rate
5. Adverse transfusion reaction rate
6. % of components issued
7. Wastage rate %

The quality indicator parameters are summarised in Table-1.

Tabe-1

	Quality Indicators	Formulae
1	Adverse Donor Reaction Rate %	No. of donors experiencing adverse reaction x 100 / Total no. of donors
2	Donor Deferral Rate %	No. of donor deferrals x 100 / Total no. of donation + total no. of deferrals
3	TTI %	Combined TTI cases (HIV + HBV + HCV + Syphilis + MP) x 100 / Total No. of Donors
4	Component QC Failures (for each component)	No. of components QC failures x 100 / Total no. of components tested
5	Adverse Transfusion Reaction Rate %	No. of adverse transfusion reactions x 100 / Total no. of blood and components issued
6	% of Components Issued	Total component issues x 100 / Total whole blood + component issues
7	Wastage Rate %	No. of blood/ blood components discarded x 100 / Total no. of blood/ blood components issued

III. Results

During the study period, 19,916 blood units were collected, total number of male donors were 19362 (97.21%) and female donors were 554 (2.79%). Out of 19916 units 357 were WB, and of the remaining blood units following components such as 19,444 PRBC, 9692 PC, and 18,622 FFP, 38 cryoprecipitates, 111 single donor platelets were prepared.

After the yearly data evaluation, ADR rate was 1.59% and thereaction observed in the majority of the donors was vasovagal in 171 (53.9%) donors, followed by hematoma in 101 (31.86%) given in figure-1. DDR was 10.36 % andthe most common cause for deferral was low haemoglobin followed by history of medication in temporary reasons for deferral. Followed by other temporary causes include underweight, history of previous donation, dengue or typhoid(figure-2). Hepatitis was most common cause among permanent reason for deferral followed by causes like jaundice, skin disease, hypertension(figure-3).TTI% was 1.4 %,and the seroprevalence of HIV, HBV, HCV, syphilis and malaria infections were found to be in 0.14%, 0.4%, 0.79%, 0.005% and 0% donors respectively (figure-4).

Our study showed ComponentQuality Failure Rate of 15.5% with highest quality control failure rate in PRBC, followed by FFP and PC with failure rate of 21%, 18.18%, and 11.57% respectively and 0% in each of Whole blood, SDP and CP (figure-5). PRBC Failure was due to decrease in volume in 10.14% units and decrease in PCV in 8.69% units of PRBC. Failure in PC was due to decrease in the platelet yield in 9% of the units of PC. In fresh frozen plasma, the main cause of failure was due to low volume of plasma in 6.8% of units. The other reasons were low fibrinogen levels (2.11%) and low factor VIII levels (2.6%).

ATRR was found to be 0.16%. 70 patients developed transfusion-related adverse effects. Female (63) patients in the age group of 20-29 years were the maximum associated with the transfusion reactions than male (7) patients.FNHTR reactions were noted in 71.5% patients, allergic reactions in 28.5% patients. Majority of the reactions were caused by PRBC 84.29% followed by FFP in 4.29% patients (figure-6).

The percentage of components issued was 99.67% and wastage rate was 12.09% with wastage rate of whole blood, PRBC, PC, FFP, CP, CPP was 43.97%,1.98%, 43.37%, 5.91 %, 26.3%, 2.74% respectively (figure-7).The reason for highest number of PC discarded was expiry, followed by seropositivity for transfusion transmitted diseases. Total 157 (43.97%) of whole blood bags were discarded. Out of these 157 bags, 49.6%were discarded due to insufficient volume of the bags, approximately 26.7%were discarded because of seropositivity for TTIs. Other causes for wastage of blood units include leakage while processing of blood, contamination, rupture, haemolysis and return of the units to the lab.

Figure-1 Distribution of types of adverse donor reactions

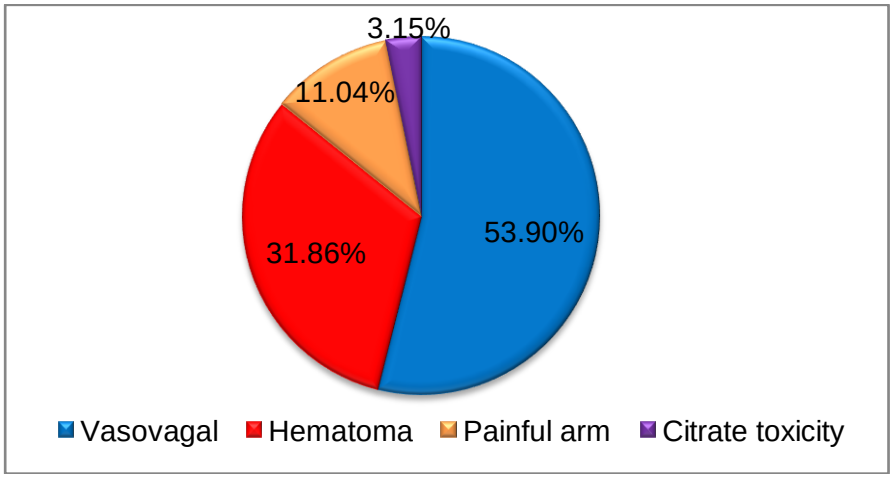


Figure-2 Temporary donor deferrals

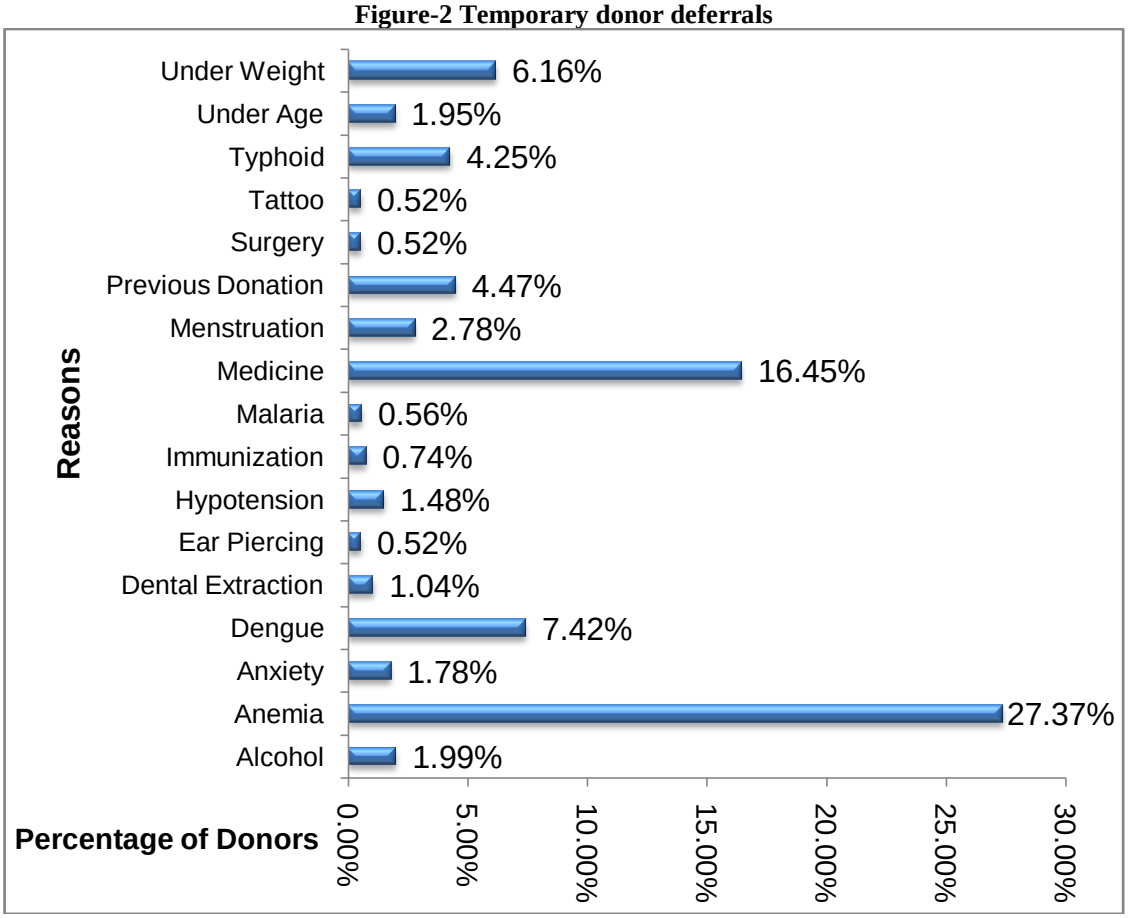


Figure-3 Permanent donor deferrals

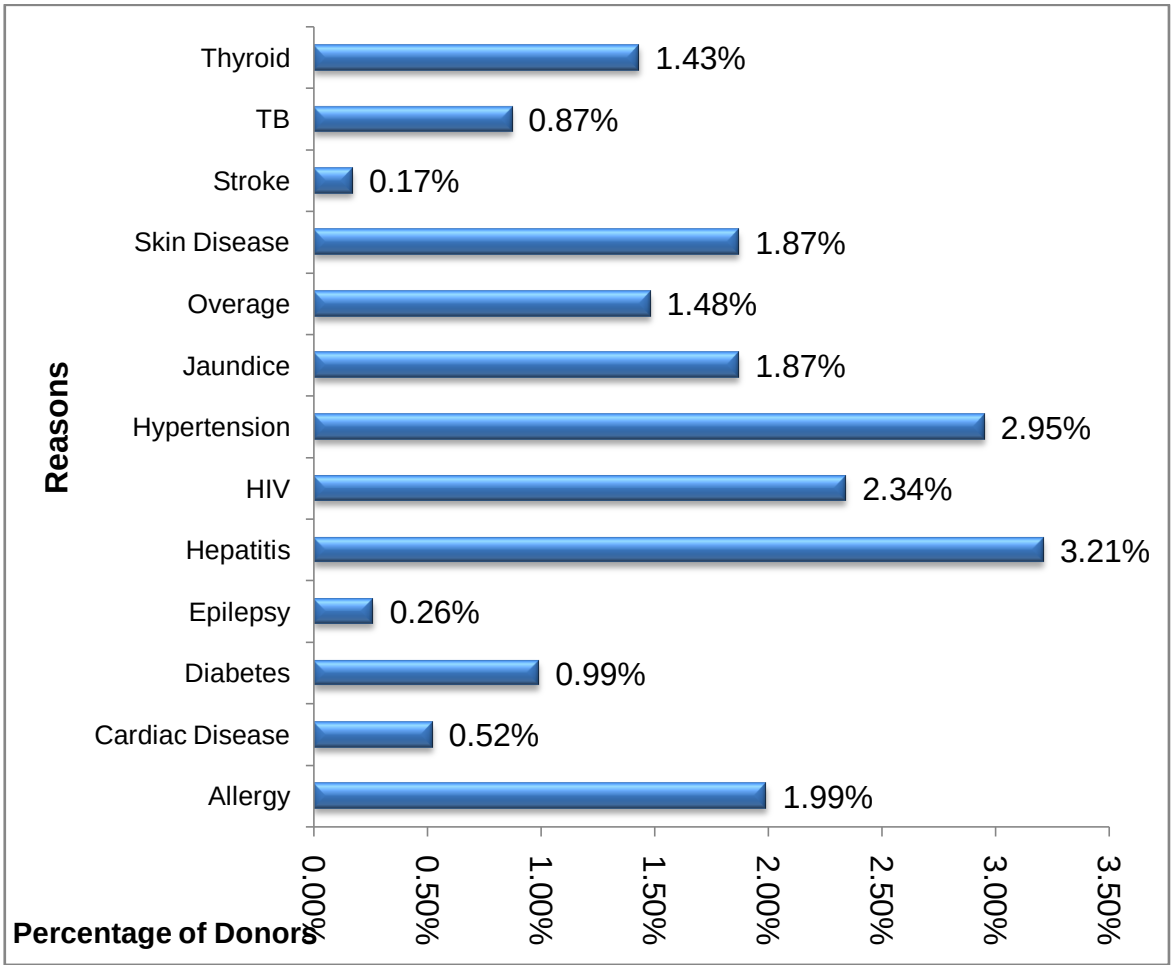


Figure-4 Distribution of transfusion transmitted infections

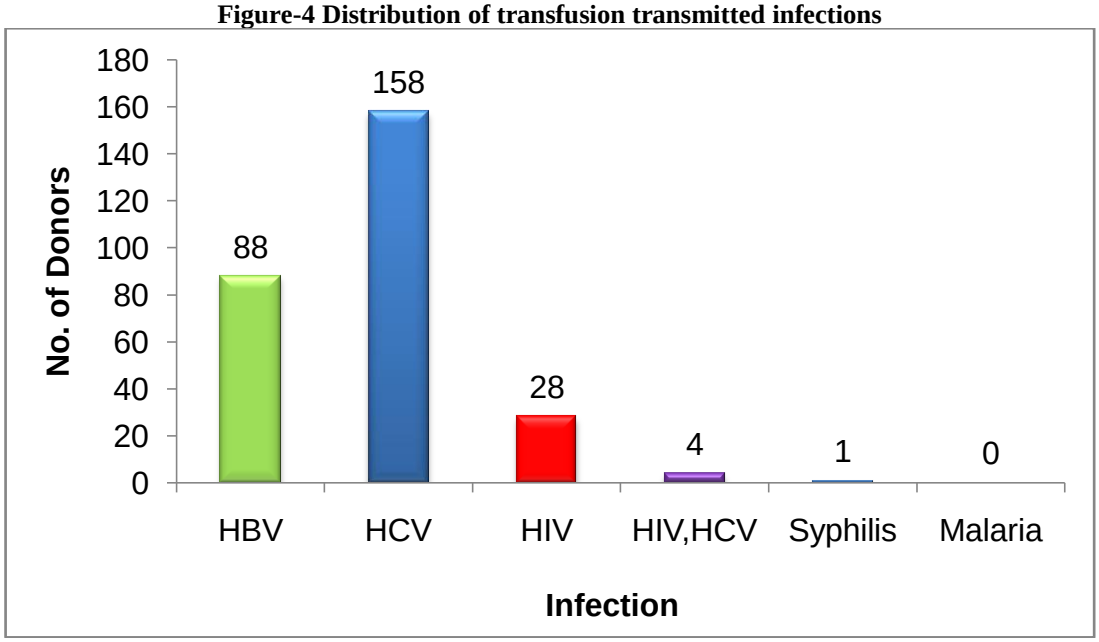


Figure-5 Component Quality Control Failure rates

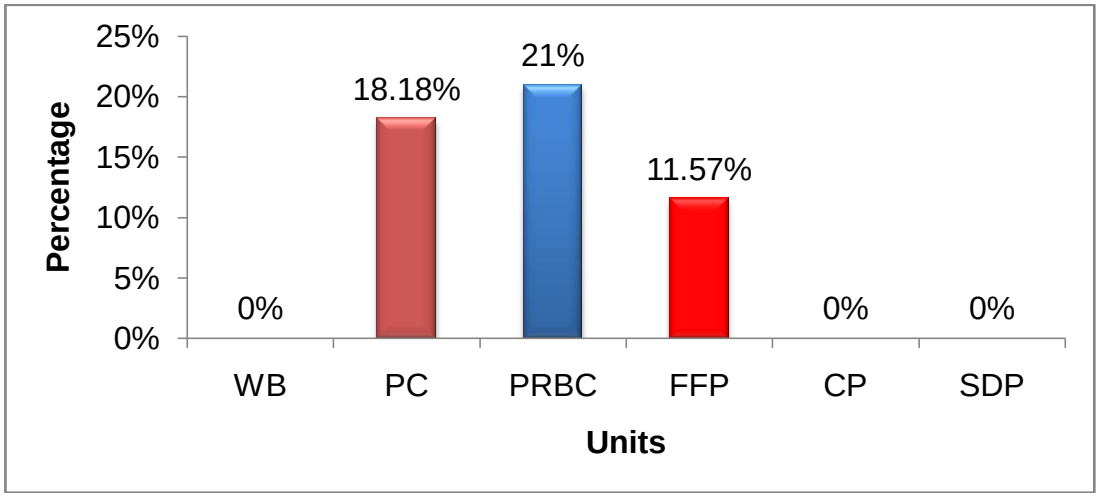


Figure-6 Components causing the adverse transfusion reactions

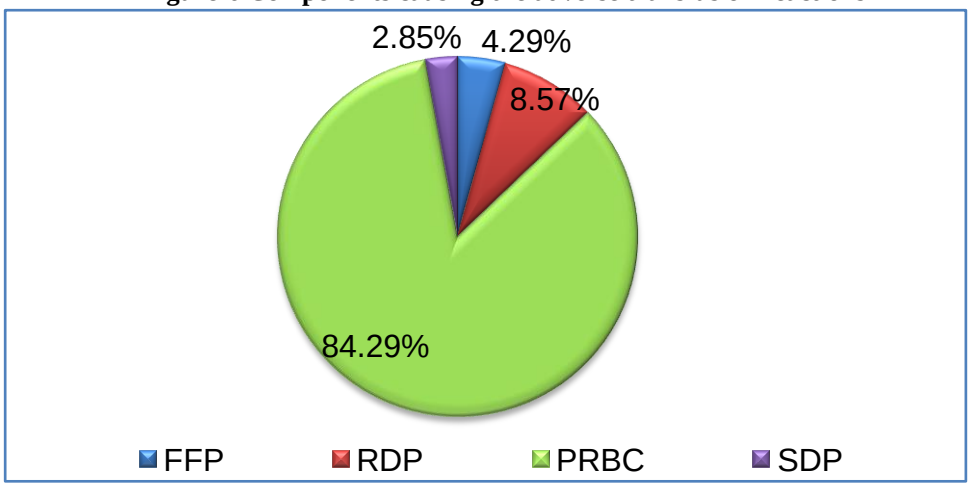
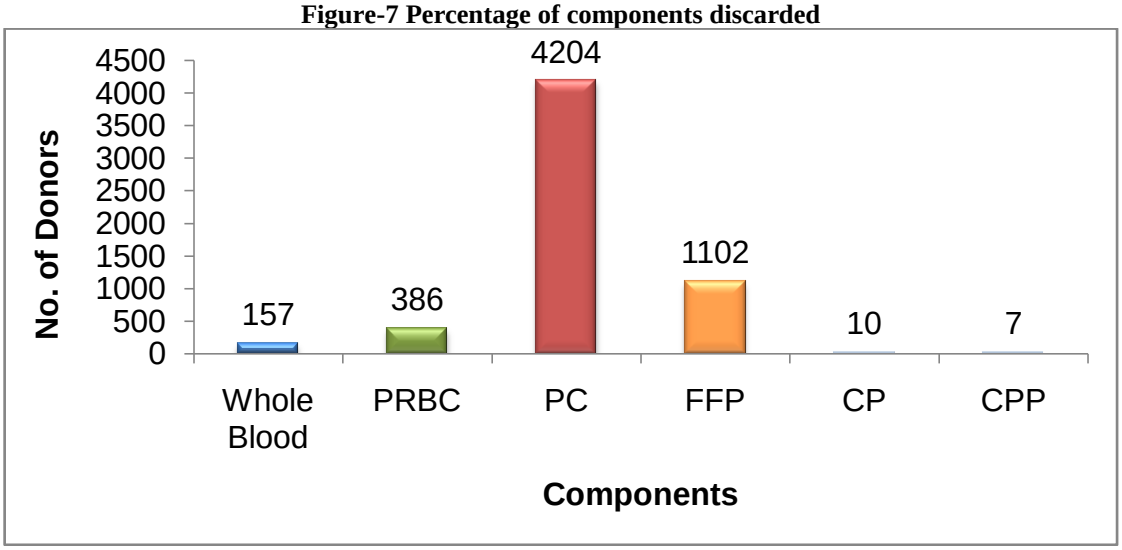


Figure-7 Percentage of components discarded



IV. Discussion

As per WHO the working definition of an indicator is 'a variable with characteristics of quality, quantity and time, used to measure changes in health and health-related situation, directly or indirectly, the progress made in addressing it and providing a basis for developing adequate plan for improvement'.[9]

The quality indicator is a measure of transfusion practice and traceability including confirmation of transfusion and it shall be defined. The indicators data should be collected and analysed on a regular basis for quality improvement.[10]

Adverse donor reaction rate was 1.59%. The total number of male donors were 19362 (97.21%) and female donors were 554(2.79%).Similar results were reported by Sultan et al[11] (2015) and John et al[12] (2017) showing adverse donor reaction rate of 1.3% and 1.60% respectively. Our study showed that majority of the reactions were vasovagal i.e. 53.9% of all the reactions. Female donors were observed with higher rate of adverse donor reaction.Women also have more difficulty when blood is withdrawn and are more susceptible to vasovagal reactions, which negatively affect their experience as donors.[13]

Donor deferral rate was found to be 11.5%. similar results were shown by Shrivastva et al[14] (2016), Valerian et al[15] (2018) in which deferral rate was 11.5% and 12.7% respectively.In our study the majority of donors deferred were among the age group of 20-29 years followed by 30-39 years age group. Study conducted by Shrivastva et al[14] (2016) also showing similar results with highest number of donor deferral among younger age group 20-29 years, followed by 30-39 years age group. However Valerian et al[15] (2018) showed highest number of donor deferrals of 46-65 years.

In our study TTI % was found to be 1.4% with seroprevalence of HCV, HBV, HIV with 0.79%, 0.14% and 0.4% respectively. Studydone by Koshy et al[16] (2014) showing seroprevalance of 2.9% however study conducted by Varshney et al[17] (2017) showed lower rate of 0.93%. Among the five transfusion transmitted infections tested at our centre, HCV was found to be more seroprevalent followed by HBV. Similar findings were reported in the study done by Koshy et al[16] (2014). However study done by Rawat et al[18] (2017) which concluded high prevalence of HBV followed by HCV.Another study done by Varshney et al[17] (2017) reported that HBsAg was more seroprevalent followed by HIV.

QC of blood components was done by the quality control criteria given by Director General of Health Services (DGHS) India.[19]Our study showed ComponentQuality Failure Rate of 15.5% with highest quality control failure rate in PRBC, followed by FFP and PC with failure rate of 21%, 18.18%, and 11.57% respectively and 0% in each of Whole blood, SDP and CP.A study conducted by Varshney et al[17] (2017) reported lowerQC failure rate i.e. 10.67% for packed red blood cells, 8.22% for platelets, 8.63% for fresh frozen plasma.

The adverse transfusion reaction rate of our study was 0.15%.Similar findings were reported by Gente et al[20] (2018), which showed rate of0.15%. Majority of the adverse transfusion reactions (ATR) were seen with PRBCs 84.2%, followed by PC 11.4% and FFP 4.29%. Varshney et al[17] (2017)showed 0.16%ATRR which is comparable to our study. 71.5% of the ATR were febrile non haemolytic reactions and allergic reactions were noted in 28.5%.Similar results were shown by the study conducted by Pahuja et al[21] (2017) showing that 54.7% of the FNHTR followed by 41.4% of the allergic reactions. Study conducted by Khoyumthem et al[22] (2018)showed that majority of the ATRwere allergic followed by FNHTR. PRBCs were more commonly involved with the transfusion reactions.

We found that the percentage of component issued in our blood bank was 99.67%. whole blood was also issued to the patients ie. 0.33% of the total collection. A study conducted by Varshney et al[17] showed comparable results with percentage of component issued i.e 98.18%.

The wastage rate in our centre was 12.09% with wastage rate of 43.97% for whole blood, 1.67% for packed red blood cells, 43.37% for platelets and 5.91% for fresh frozen plasma and 26.3% for cryoprecipitates and 0% for single donor platelets. The highest wastage rate was of whole blood followed by PC. Whole blood was discarded mainly due to insufficient volume followed by seropositivity.Main reasons for less quantity of blood were phlebotomy failure such as collapse of vein and acute donor reaction such as fainting, nausea, hematoma formation during donation.Proper donor screening and counselling effectively reduce the collection of such TTI positive units. PC was discarded due to expiry followed by seropositivity.

This results reported by other studies like Morish et al[23] (2012) which showedplatelet concentrate recorded the highest of discard at 6% (3909) followed by whole blood at 3.7%, fresh frozen plasma (FFP) at 2.5% . RBC contamination of PC and plasma components were the major cause of discard with rate of 40%. Varshney et al[17]showed highest discard rate of PC(16.11%) followed by PRBC (3.19%).The most common reason for discarded units were expired followed by seroreactivity for TTI.

V. Conclusion

Quality indicators are important tool for the better utilization and improvement of the blood transfusion services. All blood products must be safe, clinically effective, should be of appropriate and consistent quality. So the performance monitoring is necessary to increase the quality of the indicators. For all processes in blood collection, quality indicators should be defined, regularly monitored, documented,evaluated, accounted, and consequently implemented.

References

[1]. Nel TJ. Clinical guidelines, audits and hemovigilance in managing blood transfusion needs. Transfusion Alternatives in Transfusion Medicine 2008;10(2): 61-69.
[2]. Roback JD, Combs MR, Grossman BJ, Hillyer CD. MT (ASCP) SBB. Technical Manual (16thedn.). American Association of Blood Banks (AABB) 2008;24.
[3]. Roy AD, Pal A. Evaluation of 'Wastage Rate' of blood and components – an important quality indicator in blood banks. Article no. BJMMR 2015.458. BJMMR 2015;8(4):348-52.
[4]. Baesler F, Nemeth M, Martinez C, Bastias A. Analysis of inventory strategies for blood components in a regional blood center using process simulation. Transfusion. 2014;54(2):323-30.
[5]. Newman B. Blood donor suitability and donation complications. In : Handbook of Blood Banking and Transfusion Medicine. Jaypee Brothers Medical Publishers (P) Ltd. 2006;27-35.
[6]. Heddle NM, Liu Y, Barty R, Webert KE, Whittaker S, Gagliardi K, et al. Factors affecting the frequency of red blood cell outdates: an approach to establish benchmarking targets. Transfusion. 2009;49(2):219-26.
[7]. Zoric L, Daurat G, Demattei C, Martine M, Christophe B, Olivieet B, et al. Blood wastage reduction: a 10-year observational evaluation
in a large teaching institution in France. Eur J Anaesthesiol. 2013;30(5):250-55.
[8]. National Accreditation Board for Hospitals and Healthcare Providers (NABH), Quality Standards, 3rd ed. 2016.
[9]. Safe blood and blood products: indicators and quality of care. World Health Organization, Regional office for the western Pacific, Manila, Philippines. October 1996
[10]. Recommendations and Priorities for Action. Global Consultation on Haemovigilance 2012 Nov 20-22, Dubai, United Arab Emirates.Geneva: WHO Headquarters; 2013. p. 28-31.
[11]. Sultan S, Baig MA, Irfan SM, Ahmed SI, Hasan SF. Adverse Reactions in Allogeneic Blood Donors: A Tertiary Care Experience from a Developing Country. Oman Med J. 2016;31(2):124-28.
[12]. John CA, Theodora UE, Gloria AN, Chika EA. Adverse reactions to blood donation: A descriptive study of 3520 blood donors in a Nigerian tertiary hospital. Med J DY Patil Univ2017;10:36-40
[13]. PradosMadrona D, Fernández Herrera MD, Prados Jiménez D, Gómez Giraldo S, Robles Campos R. Women as whole blood donors: offers, donations and deferrals in the province of Huelva, south-western Spain. Blood Transfus. 2014;12(Suppl 1):s11-s20.
[14]. Shrivastava M, Shah N, Navaid S, Agarwal K, Sharma G. Blood donor selection and deferral pattern as an important tool for blood safety in a tertiary care hospital. Asian J Transfus Sci. 2016;10(2):122-26.
[15]. Valerian DM, Mauka WI, Kajeguka DC, Mgabo M, Juma A, Baliyima L, et al. (2018) Prevalence and causes of blood donor deferrals among clients presenting for blood donation in northern Tanzania. PLoS ONE 13(10): e0206487.
[16]. Koshy JM, Manoharan A, John M, Kaur R, Kaur P. Epidemiological profile of seropositive blooddonors at a tertiary carehospital in North India. CHRISMED J Health Res 2014;1:91-4
[17]. Varshney L, Gupta S. Quality indicators- performance tools of blood transfusion services. J. Evolution Med. Dent. Sci. 2017;6(90):6348-52.
[18]. Rawat A, Diwaker P, Gogoi P, Singh B. Seroprevalence & changing trends of transfusion-transmitted infections amongst blood donors in a Regional Blood Transfusion Centre in north India. Indian J Med Res. 2017;146(5):642-645
[19]. Saran RK. Quality Assurance in blood transfusion. In: Transfusion Medicine Technical Mannual, (2nd edn.) India: DGHS Ministry of Health and Family Welfare; 2003;352-54.
[20]. Gente VK, Basavarajegowda A, Kulkarni R, Basu D. Recipient hemovigilance at a tertiary care hospital in Southern India: A crosssectional study. Int J Adv Med Health Res 2018;5:66-70
[21]. Pahuja S, Puri V, Mahajan G, Gupta P, Jain M. Reporting adverse transfusion reactions: A retrospective study from tertiary care hospital from New Delhi, India. Asian J Transfus Sci 2017;11:6-12.
[22]. Khoyumthem P, Rachandra K, Goswami S, Lyngdoh LN, Sharma AB, Singh AM. Acute transfusion reactions in a tertiary hospital: A 2-year retrospective study. J Med Soc 2018;32:47-50
[23]. Morish M, Ayob Y, Naim N, Salman H, Muhamad NA, Yusaff NM. Quality indicators for discarding blood in the National Blood Center, Kuala Lumpur. Asian J TransfusSci 2012;6(1):19-23

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