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An audit of transfusion reaction monitoring and reporting at a cancer hospital in Pakistan- a step towards hemovigilance

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Abstract

Objective: To monitor the frequencies of different adverse transfusion reactions and to assess the compliance of clinical staff with the process of sending proper transfusion reaction workup within the specified time.

Methods: The retrospective audit was conducted at the blood bank of Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore, Pakistan, and comprised all transfusion reaction forms received from July 1, 2017, to June 30, 2018. The forms were analysed for type of blood component, time in which it was received by thw blood bank, whether or not the form was completely filled, whether or not all required samples were provided, and the type of reaction.

Results: Of the 12,787 units dispensed and transfused, 50(0.39%) transfusion reactions were noted. Allergic was the most frequent type 24(48%). Red cells accounted for 38(76%) of the reactions. In 58(95%) cases, reaction forms were completely filled. Blood bags in 36(59%) and post-transfusion ethylenediaminetetraacetic acid samples in 35(57.3%) cases were received at blood bank within 2 hours of reaction.

Conclusion: Incidence of transfusion reactions was found to be low as there was good compliance with procedures on the part of the clinical staff.

Key Words: Transfusion reactions, Haemo-vigilance, Clinical audit.

Introduction

Blood transfusion is a widely used life-saving therapeutic option around the globe, but it has never been completely safe and has many potential risks and harmful effects[1]. These risks are mainly of two types; transmission of infectious agents, and non-infectious adverse transfusion reactions (ATRs)[2]. Since the introduction of donor screening and infectious testing in the last two decades of the 20th century and then its progress through more sophisticated techniques, the risk of transfusion-transmissible infection (TTI) has markedly reduced. This has made the presence of non-infectious ATRs more apparent[3]. These reactions encompass a wide spectrum of manifestations and severity, ranging from mild allergic reactions to severe reactions like haemolytic reactions causing significant morbidity and mortality[4]. Certain safe blood transfusion practices have been adopted by many countries through programmes commonly known as haemo-vigilance[5].

Haemo-vigilance is a set of surveillance procedures for the collection and evaluation of information encompassing the entire transfusion process, from the vein of a blood donor to the vein of the recipient, with the aim of reporting and preventing various adverse effects that can happen at any stage of this whole process[6]. The concept initially came into practice in Europe when France set up the first haemo-vigilance system in 1994[7]. Since then, many countries have adopted this system. In the United Kingdom this process has been run under the umbrella of national organisation Serious Hazards of Transfusion (SHOT) since 1996[8]. Similarly, Canada started this in 2001 under the national body Transfusion Transmitted Injuries Surveillance System (TTISS) [9]. Other developed nations, like the United States, Germany, Italy, Japan, Australia and New Zealand, also have well-established haemo-vigilance systems, while developing nations in Africa, like the Republic of South Africa, Zimbabwe and others, also have this system in different forms[9-13]. In Pakistan, with the help of the German government, a national task force was established in 2010 for blood

safety reforms in the country. Since then, this body, called the Safe Blood Transfusion Programme (SBTP), has been striving to establish a national haemo-vigilance network, but due to certain factors, this has not been implemented the way it should have been[14]. The neighbouring countries of Pakistan, including China and India, are also in the developing phase of the establishment of national haemo-vigilance programmes[15, 16].

There is wide variation among the haemo-vigilance programmes of different countries most probably due to their different healthcare infrastructure and regulatory laws. For example, in France, it is mandatory to report all ATRs to the national network, while SHOT in the UK deals with voluntary reporting and that too of serious and incompatible reactions only[17, 18].

Keeping these differences aside, reporting and monitoring of ATRs is a vital part of haemo-vigilance activity. This helps in identifying the root cause of frequent reactions and taking safety measures to prevent their recurrence[19]. The role of physicians and paramedical staff involved in the administration of blood components is very important in this regard because they need to identify the signs and symptoms of different ATRs and manage these accordingly. They are also expected to notify transfusion services about the adverse reactions and send the relevant material, like transfused blood bag, patient blood and urine sample, required for the investigation of ATRs.

At Shaukat Khanum Memorial Cancer Hospital and Research Centre (SKMCH &RC) in Lahore, every ATR is reported to the blood bank. Biannually, as a part of quality indicators, a report is also made regarding the frequencies of different ATRs and is discussed in the hospital Blood Utilisation Committee (BUC). The current study was planned to not only monitor the frequencies of different ATRs, and to analyse the compliance of physicians and nurses with the procedure regarding sending the required samples and completely-filled transfusion reaction forms within the specified time.

Materials and Methods

The retrospective clinical audit was conducted at the blood bank under the Department of Pathology, SKMCH &RC, Lahore, Pakistan, and comprised all ATR forms received from July 1, 2017, to June 30, 2018 The study received exemption from the institutional ethics review board.

As per policy of the hospital, a unique serial number is assigned to each ATR form as soon they are received by the blood bank. Each form has two portions. The first portion has details of the patient, including name, medical record (MR) number, location and primary disease, clinical details of suspected transfusion reaction, including symptoms, pre- and post-transfusion vital signs and other findings, details of blood unit, including type of component, amount of blood given, time at which transfusion started and ended, and history of previous transfusion. This portion is filled by the resident doctor and staff nurse. The second portion has details of investigations carried out on the returned blood bag and patients' samples by blood bank technologist, which includes repeat cross-match on pre-transfusion sample, antibody screening, cross-match, direct antiglobulin test (DAT) and peripheral blood smear review of post-transfusion blood sample. Haematology resident also notes further relevant investigations from the Hospital Information System (HIS) if required. In the end, with the help of clinical findings provided and investigations carried out/noted from HIS, the haematology resident and consultant make conclusion about the type of ATR and note it on the form. The clinical diagnosis of ATRs is made according to the American Association of Blood Banks (AABB) guidelines[20]. The hard copy of this form is then attached in a file assigned for ATRs and kept in the blood bank. It is also made available in online patients records.

For this audit, all ATRs dor the study period were retrieved and variables noted Included demographic and clerical details, like serial number of the ATR form, age and gender of the patient, location of the patient at the time of transfusion, date on which ATR occurred; type of blood component transfused; time in

which ATR form was received in the blood bank; form was completely filled or not by resident and staff; all the required samples were provided to the blood bank in time or not; and type of ATR assigned.

Patient identification was not noted to maintain data confidentiality. Data was analysed using Microsoft (MS) Excel 2013 and frequencies and percentages were calculated.

Results

Of the 12,787 units dispensed and transfused, 6462(50.5%) were packed red blood cells (PRBCs), 2173(17.1%) were platelets from single donor apheresis, 2159(16.9%) were platelets from random donors, 1803(14%) were fresh frozen plasma (FFP), 185(1.5%) were cryoprecipitate and 5(0.03%) were whole blood. A total of 61(0.47%) ATRs were reported, but 11(18%) were declared invalid after investigations. As such, there were 50(0.39%) ATRs overall. Allergies were the most frequent type 24(48%), and PRBCs accounted for 38(76%) of the reactions (Table 1). Clinical staff compliance was assessed on the basis of all the 61 ATRs reported to the blood bank. Of them, 58(95%) were completely filled up (Table 2).

Discussion

ATR reporting is vital for blood bank services and related healthcare facilities as it improves transfusion safety. The current study observed that the incidence of reported ATRs was 1 in 256 units transfused, or 0.39% of the total blood units transfused. This is slightly higher compared to 0.11%[21] and 0.15%[22] reported by two other centres in the country. Two studies from neighbouring India also reported lower rates of 0.2% and 0.27% respectively[23,24]. This may be due to our stringent practices as per hospital policy to report each and every adverse event related to transfusion.

Allergic reactions were the most encountered events (48%) in the current study. This is more or less similar to the studies reported from Pakistan, India, and Malaysia[21,22,24,25] (Table 3). In the current study, all allergic reactions were mild, presented with rash and/or itching, managed promptly with anti-histamine. No serious anaphylactic reaction happened. Although Febrile Non-Haemolytic Transfusion Reaction (FNHTR) was the second most common reaction type in the study, the incidence has been higher in earlier studies[21,24,25]. This may be due to the fact that we neither use universal leukodepletion of blood products nor we use leukocyte filters at the time of transfusion. Both of these strategies can reduce the incidence of FNHTRs, but due to resource-constraint setting and non-availability in the country, the use of universal leukodepletion is out of question currently. The option of using leucocyte filter is also an added financial burden, but can be considered as it is being used at a few centres in the country and, through this audit's findings, the suggestion has been forwarded to the hospital management to consider this at least for a selected patient population.

The most common cause of immune acute haemolytic transfusion reaction (AHTR) is accidental ABO-incompatible red cell transfusion[26]. Interestingly, we did not encounter any AHTR. This is an indicator of the strong compliance of the blood bank and clinical staff with the policies made for reducing clerical errors. This is done by verification and cross-checking at multiple steps involving phlebotomy of donor and patient, pre-transfusion compatibility testing and issuance of product at blood bank and transfusion of blood at the bedside.

In the current study, only one case of transfusion-related acute lung injury (TRALI) was reported. Two points are worth mentioning in this regard. First, this was labelled purely based on strong clinical suspicion and post-transfusion radio-graphical findings, as diagnostic tests, like detection of anti-neutrophil/ anti-human leukocyte antigen (HLA) antibodies, are not performed in our setting because of non-availability. This further gives challenge in the recognition of TRALI, as it is solely dependent on physicians' awareness about the signs and symptoms of

this reaction which may be overlooked by them, hence, raising the possibility of under-reporting of TRALI in our setting. On the other hand, this low incidence may also be due to the fact that most cases of TRALI have been found to be linked with multiparous female donors[27]. But in our part of the world, there is a very small proportion of female blood donors, so similar incidence rates have been reported by earlier studies[21,22,24,25]. No case of transfusion-associated cardiac overload (TACO) or transfusion-associated sepsis (TAS) was reported.

It is a pleasant finding that 95% of the ATR forms submitted to blood bank were completely filled by the clinical staff. A study in Pakistan reported 84% compliance[28]. Only around 60% of the forms along with blood bag and post-transfusion blood sample were received in the blood bank within 2 hours of transfusion reaction. Furthermore, the urine sample was not sent to the blood bank in any of the ATR cases. This prompted the need to create awareness among residents and nursing staff to submit complete workup and that too within the assigned time.

Shabneez et al.[28] in their audit observed lesser rates of compliance in submitting the workup to the blood bank, but their cut-off time was one hour rather than 2 hours as practised in our hospital.

The current study is a baseline audit that has highlighted important strengths and deficiencies of the system. The plan is to rectify the deficiencies. For this, we will do teaching sessions of clinical staff to attain 100% benchmark, which will be assessed in a subsequent re-audit.

Limitations of the current study include its retrospective design and lack of complete audit cycle as a re-audit has not been performed. But there is plan to re-audit after reinforcing the correction of deficiencies noted in this audit. Another drawback is that there is no reporting of delayed transfusion reactions. This may be due to the fact that these reactions are rare and usually occur after the discharge of patients from inpatient service.

Conclusion

The incidence of ATR was 1 in 256 units transfused. Allergic reactions were the most common. No acute haemolytic or septic reaction was noted. Packed red cells were implicated in most of the reactions. There was 95% compliance of clinical staff with the standard procedures. Practices regarding submission of ATR form along with required workup to the blood bank need improvement.

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References

1) Dzik WH. Emily Cooley lecture 2002: transfusion safety in the hospital. Transfusion. 2003; 43(9):1190–9.
2) Sazama K. Reports of 355 transfusion-associated deaths: 1976 through 1985. Transfusion. 1990; 30(7):583–90
3) Vamvakas EC, Blajchman MA. Transfusion-related mortality: the ongoing risks of allogeneic blood transfusion and the available strategies for their prevention. Blood. 2009; 113(15):3406–17.
4) Sloop GD, Friedberg RC. Complications of blood transfusion. How to recognize and respond to noninfectious reactions. Postgrad Med.1995; 98(1):159–62,166,169–72
5) Murphy MF, Stanworth SJ, Yazer M. Transfusion practice and safety: current status and possibilities for improvement. Vox Sang. 2011; 100(1):46-59.
6) McClelland B, Love E, Scott S, Williamson LM. Hemovigilance: concept, Europe and UK initiatives. Vox Sang. 1998; 74(Suppl. 2):431–9.
7) Andreu G, Morel P, Forestier F, Debeir J, Rebibo D, Janvier G, et al. Hemovigilance network in France: organization and analysis of immediate

transfusion incident reports from 1994 to 1998. Transfusion. 2002; 42(10):1356–64.

8) Williamson LM, Lowe S, Love EM, Cohen H, Soldan K, McClelland DB, et al. Serious hazards of transfusion (SHOT) initiative: analysis of the first two annual reports. BMJ. 1999;319(7201):16–19.

9) Faber J.C. Worldwide overview of existing hemovigilance systems. Transfus Apher Sci. 2004;31(2): 99–110.

10) Menitove J.E. Hemovigilance in the United States of America. Vox Sang. 1998; 74(Suppl. 2):447–55.

11) Alexis RH, Sridhar VB, Koo-Whang Chung, Matthew JK. Transfusion-related adverse reactions reported to the National Healthcare Safety Network Hemovigilance Module, United States, 2010 to 2012. Transfusion. 2015;55 (4):709–718.

12) Keller-Stanislawski B, Lohmann A, Gunay S, Heiden M and Funk MB. The German Haemovigilance System—reports of serious adverse transfusion reactions between 1997 and 2007. Transfus Med. 2009;19(6):340-9

13) Giampaolo A, Piccinini V, Catalano L, Abbonizio F and Hassan HJ. The first data from the haemovigilance system in Italy. Blood Transfus. 2007; 5(2):66-74.

14) Hasan A. Zaheer, Usman Waheed. Blood safety system reforms in Pakistan. Blood Transfus. 2014;12(4):452-457

15) Shi L, Wang J.X, Stevens L, Ness P, Shan H. Blood safety and availability: continuing challenges in China's blood banking system. Transfusion. 2014; 54(2):471–82.

16) Somnath Mukherjee, Rituparna Maiti. Hemovigilance: A Current Update in Indian Perspective. J Clin Diagn Res. 2016;10(11):EE05-EE09

17) Stainsby D, Jones H, Asher D, Atterbury C, Boncinelli A, Brant L, et al (SHOT Steering Group). Serious hazards of transfusion: a decade of hemovigilance in the UK. Transfus Med Rev. 2006;20(4):273-82.
18) Rebibo D, Hauser L, Slimani A, Hervé P, Andreu G. The French Haemovigilance System: organization and results for 2003. Transfus Apher Sci. 2004;31(2):145-53.
19) Dzik WH, Corwin H, Goodnough LT, Higgins M, Kaplan H, Murphy M, et al. Patient safety and blood transfusion: new solutions. Transfus Med Rev. 2003;17(3):169–80.
20) Catherine AM, Mark AP, Patricia MK. Non-infectious complications of blood transfusion. In: Mark K. Fung, Brenda JG, Christopher DH, Connie MW, editors. Technical manual. 18th ed. United States: American Association of Blood Banks; 2014. p. 665-91.
21) Farheen Karim, Bushra Moiz, Naseem Shamsuddin, Safia Naz, Mohammad Khurshid. Root cause analysis of non-infectious transfusion complications and the lessons learnt. Transfus Apher Sci. 2014;50(1):111–17
22) M. Borhany, N. Anwar, H. Tariq, N. Fatima, A. Arshad, I. Naseer, et al. Acute blood transfusion reactions in a tertiary care hospital in Pakistan - an initiative towards haemovigilance. Transfus Med. 2019; Aug; 29(4):275-78
23) Negi G, Gaur DS, Kaur R. Blood transfusion safety: a study of adverse reactions at the blood bank of a tertiary care center. Adv Biomed Res. 2015; 4:237
24) Sidhu M, Meenia R, Yasmeen I, Akhter N. A study of transfusion related adverse events at a tertiary care centre in North India: an initiative towards hemovigilance. Int J Adv Med. 2015; 2: 206-10
25) Y Rabeya, AH Abdul-kahar, CF Leong. An audit of reported acute transfusion reactions in Universiti Kebangsaan Malaysia Medical Centre. Malays J Pathol. 2011; 33(1):25-29

26) Meghan Delaney, Silvano Wendel, Rachel S Bercovitz, Joan Cid, Claudia Cohn, Nancy M Dunbar, et al. Transfusion reactions: prevention, diagnosis, and treatment. Lancet. 2016; 388(10061):2825–36

27) Triulzi DJ, Kleinman S, Kakaiya RM, Busch MP, Norris PJ, Steele WR, et al. The effect of previous pregnancy and transfusion on HLA alloimmunization in blood donors: implications for a transfusion related acute lung injury risk reduction strategy. Transfusion. 2009; 49(9):1825–35.

28) Shabneez Hussain, Bushra Moiz, Fatima Azra Ausat, Mohammad Khurshid. Monitoring and reporting transfusion reactions as a quality indicator – a clinical audit. Transfus Apher Sci. 2015; 52:122–27

Table 1: Frequency of different transfusion reactions and implicated blood components

Components	**No. of Units transfused**	**Type of transfusion reaction**					
		Allergic	***FNHTR***	***Haemolytic***	***TRALI***	***Non-specific***	***Total***
PRBCs	6462	15	19	0	1	3	38(76%)
Platelets	4332	8	2	0	0	1	11(22%)
FFPs/ Cryoprecipitate	1988	1	0	0	0	0	1(2%)
Whole blood	5	0	0	0	0	0	0
Total	12,787	24(48%)	21(42%)	0	1(2%)	4(8%)	**50**

FNHTR: Febrile Non-Haemolytic Transfusion Reaction, TRALI: Transfusion Related Acute Lung Injury
PRBCs: Packed Red Blood Cells, FFPs: Fresh Frozen Plasma

Table 2: Samples received with transfusion reaction forms			
	Blood bag	**Post-transfusion EDTA sample**	**Urine sample**
Received within 2 hours	36 (59%)	35 (57.3%)	0
Received after 2 hours	21 (34.4%)	24 (39.3%)	0
Not received	4 (6.5%)	2 (3.2%)	61 (100%)

EDTA: Ethylenediaminetetraacetic acid

Table 3: Transfusion reactions' comparison with other studies					
Transfusion Reaction	**Our study N=50**	**Farheen et al[21], 2014 (Pakistan) N=121**	**M.Borhany et al[22], 2018 (Pakistan) N= 32**	**Sidhu et al[24], 2015 (India) N= 90**	**Y. Rabeya et al[25], 2011 (Malaysia) N= 149**
Allergic/Anaphylactic n (%)	24 (48)	71 (58)	16 (49.9)	39 (43.3)	69 (46.3)
FNHTR n (%)	21 (42)	43 (35.5)	9 (28)	33 (36.6)	61 (40.9)
AHTR n (%)	-	1 (0.8)	2 (6.2)	11 (12.2)	1 (0.6)
TAS/contamination n (%)	-	-	4 (12.5)	2 (2.2)	-
TRALI n (%)	1 (2)	2 (1.6)	1 (3.1)	1 (1.1)	-
TACO n (%)	-	2 (1.6)	0 (0)	-	-
Nonspecific n (%)	4 (8)	-	-	-	-
FNHTR: Febrile Non-Haemolytic Transfusion Reaction, AHTR: Acute Haemolytic Transfusion Reaction, TAS: Transfusion Associated Sepsis, TRALI: Transfusion Related Acute Lung Injury, TACO: Transfusion Associated Cardiac Overload					

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