BIOSCIENCES BIOTECHNOLOGY RESEARCH ASIA, December 2016. Vol. **13**(4), 2207-2210

Prevalence of Red Blood Cell Alloantibodies in Blood Donors of Zanjan Province; the Preliminary Report of the North West of Iran

Khadijeh Babaei[1], Abdolreza Esmaeilzadeh[2]*, Siamak Asadi[1]and Roya Sohrabi[1]

[1]Blood Transfusion Research Center, High Institute for Research and Education in Transfusion Medicine, Tehran, Iran.
[2]Immunology Department and Cancer Gene Therapy Research Center, Faculty of Medicine, Zanjan University of Medical Sciences, Zanjan, Iran.

http://dx.doi.org/10.13005/bbra/2385

(Received: 07 June 2016; accepted: 10 October 2016)

Red blood cell (RBC) alloantibodies, especially IgG class, are clinically significant because of their association with hemolytic disease of newborns (HDN), hemolytic transfusion reaction (HTR) and a significant reduction in the lifespan of transfused red blood cells. The frequency of RBC alloantibody was variously reported due to difference in selected population and laboratory test sensitivity from less than 0.5% to up to 60%. In the presence of these mentioned alloantibodies, preparation of antigen-negative blood products for transfusion is necessary. In this cross-sectional study, 75 donors (73 males and 2 females) participated. ABO blood group typing was performed via two methods (cell type using anti-A, anti-B and anti-D and also the reverse or serum type using defined A and B cell suspensions). The serum samples were subjected to antibody screening test utilizing commercially available kits containing three vials of RBC with known surface antigen. The results were recorded and for donors with positive results, antibody identification test was also performed using a panel of 11 RBC with known surface antigen. In this study, of 75 donors, 73 (97.33%) were male and 2 (2.66%) were female. Participated donors age range was between 19 and 66 years. The frequency of blood groups in this population were A (52%), O (29.33%), B (14.66%) and AB (4%). and also Rh^+(97.33%) and Rh^-(2.67%). Alloantibodies were detected in serum of 6 donors (8%). Identified alloantibodies were against K, c and e antigens. These antibodies were only identified in samples of men may be due to small sample size of women. No significant correlation between donor's age and type of alloantibodies were detected. The prevalence of alloantibodies in Zanjanianpopulation was 8%. Therefore, detection and identification of these antibodies in the donor population could be essential to prevent adverse hemolytic reaction in case of blood transfusion.

Key words: Alloantibody, Blood donor population, Antibody screening, Antibody identification.b

When incompatible blood transfusions due to red blood cells (RBCs) injected to stimulate an immune response in the person receiving the blood and immune antibodies are produced. The antibodies that are produced in response to foreign antigens is called alloantibodies[1,2]. Red blood cell (RBC) alloantibodies, especially IgG class, are clinically significant because of their association with hemolytic disease of newborns (HDN), hemolytic transfusion reaction (HTR) and a significant reduction in the lifespan of transfused red blood cells. The frequency of RBC alloantibody was variously reported due to difference in selected population and laboratory test sensitivity from less than 0.5% to up to 60%[3,4]. The presence

* To whom all correspondence should be addressed.
E-mail: a46reza@zums.ac.ir

of red blood cells (RBCs) antibodies in sera, preparation of antigen-negative blood products for transfusion is necessary[5]. Properly blood transfusion can save lives of patient's, but if the guidelines transfusion is not regarded, it can cause serious complications and even be lethal. The frequency of these side effects has been reported in 5.3% of recipients of blood[6]. Identification antibodies in individual who are at the diagnosis of the physician needs to recipient the blood, helps with the selection of suitable and antigen -negative products for the transfusion, the risk of complications of incompatible blood transfusions greatly reduced[7].

Antibody screening test is a simple and inexpensive method to identificationa large number of unwanted and important antibodies;which are generally against minor blood group antigens. In this method, the recipient serum samples with 2-5% suspension 11 different O blood group of red blood cells, that are display antigensof important blood groups, is incubated. These antigens include blood group D, C, E, c, e, M, N, S, s, P1, Lea, Leb, K, k, Fya, Fyb, Jka and Jkb. Identification of available antigens and compatible blood transfusions may help prevent alloimmunization[8].

Because of the importance and prevalence of antibodies against minor blood groups in individuals and have not statistics of the prevalence of antibodies in the normal population, we decided to examine frequency of alloantibodies in donor blood transfusion.

MATERIALS AND METHODS

In this cross-sectional study, 75 donors (73 males and 2 females) participated. ABO blood group typing was performed via two methods (cell type using anti-A, anti-B and anti-D and also the reverse or serum type using defined A and B cell suspensions). The serum samples were subjected to antibody screening test utilizing commercially available kits containing three vials of RBC with known surface antigen. For antibody screening, the serum from the clot was separated by centrifugation at 3000 RPM for 10 minutes, and then in three separate tubes added two drops of serum and a drop of cell suspension added them. The tubes were centrifuged for 30 seconds and the agglutination and hemolysis was checked and 2 drops of 22% albumin added to the tubes and the tubes have incubated for 30-15 minutes at 37 C. Then the tubes were centrifuged at 3000 RPM for 30 seconds and the agglutination and hemolysis were checked. Then the tubes washed 3 times with saline and completely dried up, and each tube 2 drops of Anti-Human Globulin commercially available added. The tubes were centrifuged at 3000 RPM for 30 seconds and the agglutination and hemolysis were checked. The results were recorded and for donors with positive results, antibody identification test was also performed using a panel of 11 RBC with known surface antigens (D, C, E, c, e, f, V, C^W, M, N, S, s, Lu^a, Lu^b, P1, Le^a, Le^b, K, k, Fy^a, Fy^b, Jk^a and Jk^b). In the end, the results obtained were analyzed.

RESULTS

In this study, of 75 donors, 73 (97.33%) were male and 2 (2.66%) were female. Participated donors age range was between 19 and 66 years.The frequency of blood groups in this population were A (52%), O (29.33%), B (14.66%) and AB (4%). and

Table 1. Prevalence of Alloantibody in Zanjanian population

Alloantibody	Total
K	4 (%66.66)
c	1 (%16.66)
e	1 (%16.66)

Table 2. Gender distribution in Zanjanian population

Gender	Total
Male	73 (%97.33)
Female	2 (%2.66)

Table 3. The frequency of blood groups in Zanjanian population

Blood Groups	Total
A^+	37 (%49.33)
A^-	2 (%2.66)
B^+	11 (%14.66)
AB^+	3 (%4)
O^+	20 (%20.66)
O^-	2 (2.66)

also Rh^+(97.33%) and Rh^-(2.67%).Alloantibodies were detected in serum of 6 donors (8%). Identified alloantibodies were against K, c and e antigens.These antibodies were only identified in samples of men may be due to small sample size of women. No significant correlation between donor's age and type of alloantibodies were detected.

DISCUSSION

The prevalence of alloantibodies in Zanjanian population was 8%. In a study conducted in Minnesota region on normal population between 1975 and 1995, the rate of prevalence of alloantibody against Red cell antigens was less than one percent.the most prevalent antibody was against E, Le and K antigens[9]. In another study, in Kuwait, the prevalence of alloantibodies was % 0.49. The prevalence of alloantibodies in the population of Kuwaiti women was higher than men[10]. In our study, alloantibodies were only identified in samples of men may be due to small sample size of women.In a study conducted in Tehran (Iran)between 1997 and 1998, No significant correlation between gender and the incidence of alloantibodies not found[11]. In a study conductedin the blood bank of UniversityKebangsaan Malaysia Medical Centre in 2010, the prevalence of alloantibodies was %0.76.The most prevalent antibody was Anti-Mai (%30.4).Anti-E and anti-c were the most common combination of multiple alloantibodies[12]. In another study, in Eastern India, in 2015, the prevalence of alloantibodies was %5.6. The most prevalent antibody was against c antigen (%28.75)[13].In Iran, study about the prevalence of alloantibodies in the normal population has not been done.In a study conducted in Tehran between 1997 and 1998, the rate of prevalence of alloantibodies in patients referred to the hospital for surgery was%0.97.In this study,the most prevalent antibody was against Rh (Anti-E and Anti-c) and Kell (Anti-K) antigens[11]. In a study conducted in Imam Khomeini hospital on outpatient surgery in 2013, the rate of prevalence of alloantibody against Red cell antigenswas % 0.9[14]. In a study conducted in southwestern Iran in 2013,in patients with thalassemia major and Intermediate, the rate of prevalence of alloantibodies was % 18.7 and the rate of prevalence of autoantibodies was %12.7. In addition to the alloantibodies, autoantibodies are also a source of danger and must be evaluated. In this study, the most prevalent antibody was against Rh (%55) and Kell (%33) antigens[15]. In a study conducted in northeastern Iran in 2009 on 133 in patients with thalassemia disease is detected 12 alloantibodies in 9 patient that these antibodies were against Rh (D, C and E) antigens.The most commonly detected antibodies were against D (88/88%) antigens[16]. The most prevalent alloantibody was against K (% 66.66), c (% 16.66) and e (% 16.66) antigens in Zanjanian population (our study). In a study conducted in Ardabil, the most prevalentof alloantibodywas against K (%30), E (%15) and c (%15) antigens[11].In a study conducted in southeastern Iran in patients with thalassemia major, the rate of prevalence of alloantibody was %17.9 that these antibodies were against Rh and Kell antigens[17].In a study conducted at four hospitals in Tehran, in 3092 patients referred to the hospital for surgery have been identified 30 alloantibodies Identified.Alloantibodieswere Anti-Kell (% 23.53), Anti-E (% 20.59), and Anti-c (% 17.56)[18].In a study conducted in Yazd (Iran) Iran in patients with beta thalassemia, the rate of prevalence of alloantibody was %4 that these antibodies were against Kell, C and D antigens[19]. In another study from northwest of Iran, in 2016, in patient with beta thalassemia major, the rate of prevalence of alloantibody was %16.32 that these antibodies were against Kell, E and c antigens[20].

CONCLUSION

The prevalence of alloantibodies in Zanjanianpopulation was 8%. Therefore, detection and identification of these antibodies in the donor population could be essential to prevent adverse hemolytic reaction in case of blood transfusion.

REFERENCES

1. Lerner NB, Rafaai MA, Blumberg N. Red cell Transfusion. In: Williams hematology. 8th ed. New York: McGraw-Hill 2010: 2287-98.
2. McPherson RA, Pincus MR: Henry's Clinical Diagnosis and Management by Laboratory Methods. 22th ed. Pennsylvania: Elsevier Saunders 2011; 674-711.
3. Khademi R., Gharehbaghian A., KarimiGh., Vafaiyan V., Khademi R., TabriziNamini M.

Frequency &specifity of RBC alloantibodies in patients due for surgery in Iran. *Indian J Med Res* 2013; 138: 48-52.

4. Kosaryan M, Mahdavi MR, Roshan P, Hojjati MT. Prevalence of alloimmunisation in patients with beta thalassaemia major. *Blood Transfusion.* 2012; **10**(3): 396-7.
5. Carson JL, Grossman BJ, Kleinman S, Tinmouth AT, Marques MB, Fung MK, et al. Red blood cell transfusion: a clinical practice guideline from the AABB.*Clinical Transfusion Medicine Committee of the AABB. Ann Intern Med,* 2012; **157**(1): 49-58.
6. Nicholls MD. Transfusion: morbidity and mortality. *Anaesth Intensive Care*. 1993; **21** (1): 15-9.
7. Eder AF, Chambers LA. Non-infectious complications of blood transfusion. *Arch Pathol Lab Med.* 2007;**131**(5):708-18.
8. Chow EY. The impact of the type and screen test policy on hospital transfusion practice. *Hong Kong Med J.* 1999; **5**(3):275-279.
9. Jeffrey L. Winters, Alvaro A. Pineda, Lemuel D. Gorden,et al. RBC alloantibody specificity and antigen potency in Olmsted County, Minnesota. *Transfusion.*2001; **41**:1413-1420.
10. Ameen R, Al-eyaadi O, Alshemmari S, Chowdhury R, Albashiri A. Frequency of red blood cell alloantibody in Kuwaitu population. *Med princpract.*2005; **14**:230-234.
11. Khademi R., Gharehbaghian A., KarimiGh., Vafaiyan V., Khademi R., TabriziNamini M. Frequency &specifity of RBC alloantibodies in patients due for surgery in Iran. *Indian J Med Res* 2013; **138**: 48-52.
12. RabeyaYousuf, Suria Abdul Aziz, NurasyikinYusof, Chooi Fun Leong.Incidence of Red Cell Alloantibody among the Transfusion Recipients of UniversitiKebangsaan Malaysia Medical Centre. *Indian J Hematol Blood Transfus.*2013; **29**(2): 65-70.
13. SuvroSankhaDatta, SomnathMukherjee, BiplabenduTalukder, Prasun Bhattacharya, Krishnendu Mukherjee. Frequency of red cell alloimmunization and autoimmunization in thalassemia patients: A report from eastern India. Hematology. 2015;Article ID 610931.
14. Ahmad Gharehbaghian, Behrooz Ghezelbash , Sima Aghazade, Mohammad Taher Hojjati. Evaluation of alloimmunization rate and necessity of blood type and screening test among patients candidate for elective surgery.*Int J HematolOnco Stem Cell Res*. 2014;**8**(1):1-4.
15. Keikhaei B, Hirad Far A, Abolghasemi H, Mousakhani H, Ghanavat M, Moghadam M, Falsafi-Zadeh S, KarimiZ,GhasemZadeh A, DorAliNabi N, JoulharNejad S. Red Blood Cell Alloimmunization in Patients with Thalassemia Major and Intermediate in Southwest Iran.*IJBC.* 2013;**6**(1): 41-46.
16. Sadeghian MH, Keramati MR, Badiei Z, Ravarian M, Aytollahi H, Rafatpanah H, Khaje-Daluei M. Alloimmunization among transfusion-dependent thalassemia patients. *Asian J Transfuse Sci*. 2009; **3**(2):95-8.
17. Mirzaeian Amin, TamaddonGholamhossein, Naderi Majid, HosseinpourMarziyeh, Sargolzaie Narges, Dorgalaleh Akbar and TabibianShadi. Prevalence of Alloimmunization against RBC Antigens in Thalassemia Major Patients in South East of Iran. *J Blood Disorders Transf.* 2013; **4**: 4.
18. Khademi Reyhaneh, Gharehbaghian Ahmad, Karimi Gharib, Vafaiyan Vida, KhademiRaheleh & Tabrizi Namini Mehdi. Frequency & specificity of RBC alloantibodies in patientsdue for surgery in Iran. *Indian J Med Res* 2013; **138**: 252-256.
19. Vaziri M, JavadzadehShahshahani H, Moghaddam M, Taghvaee N. Prevalence and specificities of red cell alloantibodies in transfusion-dependent beta thalassemia patients in Yazd.*Iranian Journal of Pediatric Hematology Oncology.* 2015; **5**(2).
20. Kambiz Davari, Mohammad Soleiman Soltanpour. Study of alloimmunization and autoimmunization in Iranian β-thalassemia major patients. *Asian J Transfus Sci*. 2016; **10:** 88-92.