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Prevalence of Antibodies of Red Blood Cells in Whole Blood Donors

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Abstract – The Clinical Use of Blood is one of a number of learning resources produced by WHO/BTS to support the organization's worldwide blood safety policy. It focuses on the clinical aspects of blood transfusions and seeks to demonstrate how needless transfusions may be eliminated at all levels of the health-care system in any nation without jeopardizing quality and safety requirements. The purpose of this research was to determine the frequency, origin, and type of unexpected red cell antibodies in a large group of whole blood donors in north India. From January through December, blood donor samples were tested for antibodies in this three-year prospective observational research. In our donor group, red cell antibodies were found in 0.17 % of the time. 86.7% donors with red cell antibodies had alloantibodies, 10.5% had autoantibodies, and eight donors 2.8% had positive antibody screening with ambiguous findings. Current transfusion procedures make all immunization to red cell antigens a difficult job. Antibody testing in blood donors has the potential to enhance the quality and safety of blood transfusions for recipients. It also lowers the chance of problems from blood transfusions that aren't compatible.

Keywords – Antibody screening; Blood transfusion safety; Red blood cell (RBC) panel; Alloantibody identification; whole blood donors.

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INTRODUCTION

Antibodies that are reactive at 37°C or in the anti-human globulin phase of testing are referred to as irregular allo/autoantibodies. Antibodies react in a variety of ways, some of which are surprising. These antibodies have been found in healthy blood donors who have previously been transfused or in multiparous women. According to the National Blood Policy of India, 2007, blood donors should be tested for abnormal red cell antibodies in addition to infectious marker screening to prevent any harmful transfusion responses, particularly when plasma components are transfused.

There is a scarcity of research on the frequency of irregular red cell antibodies in the community of whole blood donors. According to different research, the frequency of irregular antibodies varies from 5 to 10 per 10,000 blood donors.

Red blood cell (RBC) transfusions are often used to treat acute complications of sickle cell disease (SCD). 90 percent of individuals with sickle cell disease are expected to need at least one transfusion throughout their lives. Many individuals with SCD, on the other hand, get several transfusions throughout their lifetimes, significantly increasing their exposure to donor unit RBC alloantigens. As a result, these patients are more prone to generate alloantibodies. RBC alloimmunization may have negative consequences, such as delayed hemolytic transfusion reactions (DHTRs), which can restrict the number of safe transfusions available. Alloimmunization has been found to occur in 20–50% of people with SCD. Antibodies and memory cells are produced when the recipient immune system recognizes antigens, proteins, and membrane glycoproteins on RBCs.

MATERIAL AND METHODS:

After receiving permission from the Institutional Ethics Committee, this prospective observational research was carried out at the department. All blood donors who took part in the research gave their written informed permission. After completing out a blood donor inquiry form, all blood donors were vetted. This form asked for basic information about donors, such as their name, age, gender, and address, as well as any previous blood transfusions, trauma, surgery, medication consumption, jaundice, high-risk behavior, and other clinically relevant illnesses. From January to December (2 years), blood donor samples for red cell antibody testing were examined.

All blood donors were first screened for antibodies using a fully automated technology and a commercially accessible single vial of two pooled

donors. Positive blood samples were tested for specificity using commercially available three and eleven red cell panels with auto-control (Diagast, Hemaident, Avenue Eugène Avinée, France) according to the manufacturer's instructions. Antibody detection findings were deemed positive if reactivity in the form of agglutination or haemolysis was detected. The therapeutic relevance of an antibody was evaluated by its reactivity at various temperatures (4, 22, and 37°C, thermal amplitude) and phases, including normal saline and antihuman globulin serum (AHG). Clinically relevant antibodies were those that reacted at 37°C or in the AHG phase. Antibodies against M, N, Lea, Leb, and P1 did not react in the saline phase but not at 37°C or in the AHG phase, while antibodies of the IgM type did not respond in the saline phase but not at 37°C or in the AHG phase. A total of 120 alloantibodies were found in the blood types listed above. The remaining 128 alloantibodies responded at 37°C and were clinically significant. The antigen phenotype of the donor and the likelihood of antibody positivity were also considered in the final interpretation of the findings. In all instances where the auto-control was positive, a direct antiglobulin test (DAT) was conducted. As a result, 120 platelet concentrates and 128 plasma units were eliminated. If a unit tested positive for autoantibody (both DAT and auto-control), no blood components were produced and the unit was destroyed altogether.

Data was gathered from blood bank records for statistical analysis. SPSS version 18.0 was used to process the data (SPSS Inc., Chicago, IL, USA). The odds ratio was also analyzed to see whether female blood donors were more likely to become alloimmunized than male blood donors.

RESULTS:

During the research period, antibody screening was performed on healthy blood donors, with 93.6 percent male and 6.4 percent female donors. Of these, 31 % were voluntary donors and 69 % were related or replacement donors with age groups ranging from 18 to 65 years. Antibody screening results were positive including 85.3% male donors and 14.7% female donors. The overall prevalence of red cell antibodies was 0.17 %. Alloantibodies were found in 85.0 percent of men and 15.0 percent of females, autoantibodies were found in 86.6 percent of males and 13.4 percent of females, and 87.5 percent of males and 12.5 percent of females had positive antibody screening with ambiguous findings (Table 1).

Table 1: Whole blood donors with normal and red cell antibody positive profiles

Blood donors	Total whole blood donors	Alloantibody-positive donors	Autoantibody-positive donors	Donors with inconclusive results
Male (%)	93.6	85.0	86.6	87.5
Female (%)	6.4	15.0	13.4	12.5

26.2 % females and 2% of the vaccinated donor group had previously had blood transfusions. None of the non-immunized donors provided a previous history of blood transfusion. In the vaccinated and non-immunized groups, 92.8% female donors, respectively, had a history of pregnancies (Table 2).

Table 2: Donor characteristics associated with positive antibody testing

Donors	Gender		ABO blood group				Rh blood group		History of blood transfusion		
	Male	Female	A	B	AB	O	D positive	D negative	Male	Female	History of pregnancy in female donors
Percentage	85.3	14.7	24.5	35.7	7.7	32.1	92.3	7.7	2.0	26.2	92.8

There were no allow and autoantibodies in any of the donors. Male blood donors formed alloantibodies at a rate of 0.14 %, whereas female blood donors formed alloantibodies at a rate of 0.35 percent. Female blood donors had a substantially higher rate of alloantibodies than male blood donors. Pregnancy was the most frequent cause of red cell antibody production, followed by blood transfusion and aetiology unclear in many of the blood donors in the research. Antibody screening findings that are inconclusive may be due to low titer, poor affinity, being in the development stage, or being directed against antigens not included in the identification panel.

Antibodies against the MNS blood group system were the most frequent, followed by antibodies against the Rh blood group system. Anti-M (20.5%) was the most common alloantibody identified in the MNS blood group system, followed by anti-N (11.0%). Anti-D was the most prevalent antibody in the Rh blood group system 7.2 %, followed by anti-E. (4.0 %) (Table 3)

Table 3: Varying blood group systems have different frequencies of red cell alloantibodies in whole blood donors

Blood group system	Alloantibody	Frequency (%)	Antibody specificity in female donors with pregnancy and blood transfusion	Antibody specificity in female donors with a history of pregnancy but no blood transfusion	Antibody specificity in male donors with history of blood transfusion	Antibody specificity in male donors without history of blood transfesion
MNS	Anti-M	20.5	-	-	-	51
	Anti-N	11.0	-	-	-	28
	Anti-S	3.2	1	1	-	6
Kidd	Anti-Jk^a	4.0	1	-	-	9
	Anti-Jk^b	4.4	-	2	1	8
Duffy	Anti-Fy^a	5.3	-	-	1	12
	Anti-Fy^b	4.0	-	1	-	9
Kell	Anti-K	4.0	1	1	1	7
	Anti-Kp^b	2.9	-	1	-	6
Lutheran	Anti-Lu^b	2.1	-	-	-	5
P	Anti-P1	4.0	-	-	-	10
Rh	Anti-D	7.2	4	9	2	3
	Anti-C	3.2	1	5	-	2
	Anti-E	4.0	-	1	-	9
	Anti-Cw	3.7	-	1	-	8
	Anti-c	2.6	-	2	-	4

CONCLUSION:

The aim of this cross-sectional study was to see how many patients had RBC all immunization. In this three-year prospective observational study, blood donor samples were examined for antibodies from January to December (2 years). Blood donor antibody testing has the potential to improve the quality and safety of blood transfusions for recipients. It also lowers the chance of problems from blood transfusions that are incompatible.

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