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Phenotype Frequencies of Blood Group Systems (ABO, Rh, Kell) Among Deferent Patients in Jaipur-India

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ABSTRACT

Background: With the industrial revolution of modern equipment and preparation of reagents, but in most blood banks; blood transfusions are done based on ABO & Rh antigens for pre-transfusion compatibility testing and achieved by random cross-matching of available units in the inventory storage. Unknown phenotype blood group for clinically significant antigens may cause in immunization Aim: To determine the frequency of ABO, kell, Rh blood grouping, Du testing and antigen profile. Materials and Methods: A total of 103 samples were collected from deferent patients at Nims and SDM Hospital in Jaipur-India. Laboratory investigations were have done to all the studied patients including: ABO, Rh blood grouping and Du testing have done by (BioVue cassettes based on Column Agglutination Technology), finally antigen profile (Rh- Kell Phenotype) by DiaMed ID-Card (C-c-E-e-K-Ctl, Monoclonal). Results: Total of 103 patients of deferent diseases 54 (52.5%) were males and 49 (47.5%) were females. The prevalence of Rh positive was 82.5%.The most common in distribution of ABO group system was B group (40.5%) flowed by O (26.5%) then A group (23%). The most antigen frequent was antigen (e: 87.4%) and flowed by D: 82.5%, C: 70.8%, c: 65%, E: 11.6%, while kell antigen was (2.9%). Conclusion: Our study, first step to make a rare donor antigens database bank and patients' antibodies also, to provide compatible blood to all multiple blood transfused, alloimmunized patients and enhance safety in transfusion medicine.

Keywords: Phenotype frequency; ABO; Rh; Kell; Rajasthan.

I. INTRODUCTION

With the industrial revolution of modern equipment and preparation of reagents, but in most blood banks; blood transfusions are done based on ABO & Rh antigens for pre-transfusion compatibility testing and achieved by random cross-matching of available units in the inventory storage.[1,2,3] But unknown phenotype blood group for clinically significant antigens may cause in immunization especially in multiple blood transfused patients as thalassemia, sickle cell disease and chronic renal failure.[4] There up to 305 red blood cell antigens are known, and clustered into 35 blood grouping, nine of which are considered to be main blood group (ABO, Rh, Kell, Kidd, Duffy, MNS, P, Lewis, and Lutheran). [5,6] Information about all blood groups antigens frequency in population can be helpful for future management; patient who doesn't has an antigen on his RBCs can produce alloantibody against RBCs, consequently transfusion of present antigen to this patient can cause alloimmunization, it helps to supply antigen negative compatible RBC more easily especially for patient with development multiple antibodies, we also can make a data bank of antigens frequency in our volunteer donors for preparation of reagents panels cells using in antibody detection and identification, useful also in genetic linkage analysis.[7,8] Produce alloantibodies against red blood cell antigens can cause immediately or delayed hemolytic transfusion reaction.[2] The criteria for selection of donor cells have to focuses on negative of antigens on donor's cells for the antibodies that are detected in the patient's serum.[9] Only few studies are available, reported antigens frequencies of ABO, Rh and Kell blood groups in India but not reported in Rajasthatni patients. Therefore, this study is the first report on the frequency of ABO, Rh and Kell among deferent patients in Jaipur city.

Most data on previous literatures have determined European, American and some Asian phenotypes of blood group.[6] In this study, we have determined frequencies of these phenotypes in Jaipur. Suggestion

for future studies, we hope do phenotype frequencies to be determine in all parts of India because great country and a vast with several distinct population.

II. MATERIALS AND METHODS

A total of 103 samples were collected from deferent patients at Nims and SDM Hospital. This study was approved by ethical committee from Nims University, and an informed consent was obtained from the patients after explaining the purpose of the study. One blood sample with volume of 2 ml was collected from each patient for standard tube EDTA. Laboratory investigations were have done to all the studied patients including: ABO, Rh blood grouping and Du testing have done by (BioVue cassettes based on Column Agglutination Technology), finally antigen profile (Rh-Kell Phenotype) by DiaMed ID-Card (C-c-E-e-K-Ctl, Monoclonal). A cross sectional study was done in the blood bank at SDM Hospital during the period from April 2016 to August 2017.

III. RESULTS

Out of 103 deferent patients diagnosed in clinics of Nims and SDM Hospital, some patients received at least two unit of red blood cell transfusion. All samples were screened for ABO, Rh blood grouping, Du testing and antigen profile. Total of 103 patients of deferent diseases 54 (52.5%) were males and 49 (47.5%) were females. The age range was from new borne (few days) to 85 years with the mean age of 23 years. Eighty five patients (83%) of the total number of patients (103) were found to have Rh positive (Figure 1). The most common in distribution of ABO, Rh and Kell blood group system was B group flowed by O then A group of these patients (Table 1, Figure 1). Out of 103 patients, the most antigen frequent was antigen (e) which is detected in 90 patients (87.4%) and flowed by D: 82.5%, C: 70.8%, c: 65%, E: 11.6%, while kell antigen was less one, only detected in 3 patients (2.9%) shows on Table 2.

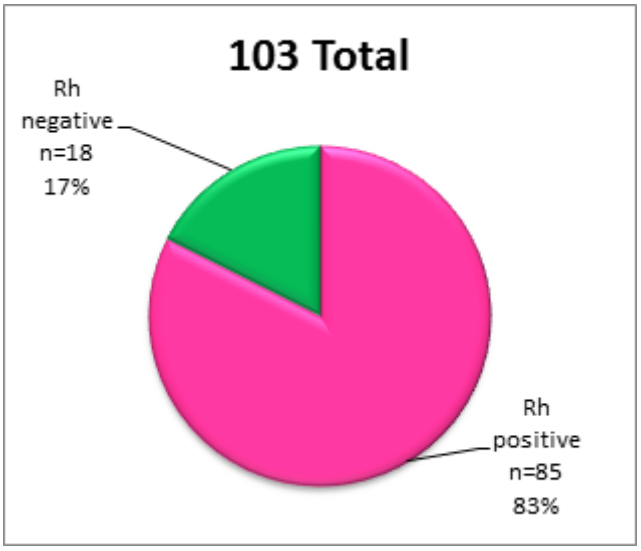

Figure 1. Prevalence of Rh antigen in patients

Table 1. Frequency of ABO, Rh, Du and Kell system

Blood group	Total	%	Phenotype	Total	%	Allele
A	24	23	A Positive	18	17.5	A
			A Negative	6	5.8	
B	41	40.5	B Positive	36	35	B
			B Negative	5	4.8	
AB	11	10	AB Positive	9	8.7	---
			AB Negative	2	1.9	
O	27	26.5	O Positive	21	20.5	O
			O Negative	6	5.8	
Total	103	100%	----------	103	100%	---
Rh	103	85	Positive	85	83	D
			Negative	18	17	d
Du test	18		Du+	4	22	--
			Du -	14	78	--
Kell	103	100	Positive	3		--
			Negative	100	--	--

Figure 2. Distribution of ABO, Rh and Kell blood group system

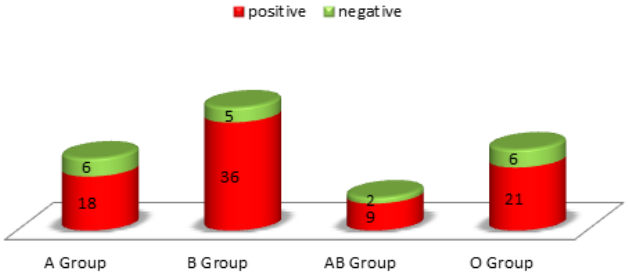

Table 2. Frequencies of ABO, Kell, and Rh phenotype compared with local and international studies

Place	Jaipur, Raj-India	South Gujarat, India	North India, Chandigarh	Iran	White	black	Germany	West Africa	Cameroun	New Delhi India	North India
Antigen, Reference	Present Study (%)	9	8	7	11	11	4	1	12	10	13
D	82.5	84.3	84	90.2	85	92	82.7	92.9	95	94.4	95.37
C	70.8	81.7	76	75.9	78	32	---	21.9	95	---	---
c	65	56.3	52.8	73.9	80	99	---	99.8	97.5	---	---
E	11.6	21.7	17.9	29.5	29	2	---	13.8	92.5	---	---
e	87.4	100	98.3	97.9	98	98	---	99.8	97.5	---	---
K	2.9	6	5.6	5.7	8.8	2	7.8	0.8	---	8.8	4.04
A	23	---	---	29.5	40	27	43.3	---	---	21.9	21.7
B	41	---	---	28.7	11	20	10.7	---	---	36.5	37.4
AB	11	---	---	7.9	4	4	4.8	---	---	9.2	9
O	27	---	---	33.9	45	49	41.2		---	32.4	32.8

IV. DISCUSSIONS

Our study focused on 103 deferent patients, most patients receive regular blood transfusion. The techniques used were the latest modern sensitive methods (Column Agglutination Technology) to ensure accurate results. Knowledge of various ABO, Rh and Kell blood group antigen and phenotype frequencies in a population is important in future to improve of blood transfusion service.[8] Information in Indian population is limited whereas this is the first study to report the antigens and phenotypes frequencies of various blood group systems in Rajasthani population and first study selected patients, while all previous studies selected donors.

The Rh blood group system is the most polymorphic, and, next to ABO, is the most clinically significant blood group in transfusion medicine.[7]

All of our results have been compared with those from a previous study, and with data from other published articles from India and abroad Table 2.

In this study, B was the most common blood group followed closely by the O group then A group. This finding is in concordance with other studies published from India [10, (4)]. However, overall worldwide frequency of the B antigen is low, excluding some areas, such as Germany and central Asia and Africa.[4] In studies from Europe, America, and South East Asia, the O antigen has been found to be the most common blood group.[10] While A group the most common in Germany.[4] The phenotype frequencies in Kell antigen was 2.9% more than in 2% (black) and West Africa1 0.8%, but less than from all local & international studies.(4,7,8,9,10)

The worldwide incidence of D antigen is different in different ethnic groups it being 85% in whites and 92% in blacks.(5) In the present study we found D antigen frequency to be 82.5% which is comparable to other studies from India that compatible with some studies as Thakral[8] was 84% and Manoj A.[9] was 84.35%, and less than from some studies in India (94.4%.[10], 95.4%.(4)) that are smaller to international studies as (West Africa[1] 92.9%, Iran[7] 90.2% and Cameroun(2) 95%) but compatible with Germany[4] 82.7% . The reason for this discrepancy may be because deferent of ethnic and sample size.

The frequency of C antigen in our study was 70.8%, which is low as compared to 78% (in Whites) and higher than 32% (in Blacks)(5) and West Africa[1] 21.9%, but lower than in some studies in India (south Gujarat[9] 81.7% and North India[8] 76%). While C antigen in Cameroun was 95%.(2)

The phenotype frequencies of (c) antigen was found to be positive in 65% of our samples, which is more than in

south Gujarat 56.3% and north India 52.8%, but less than 80% (in Whites), 96% (in Blacks) and all international studies.[1,(2),7]

Phenotype (e) antigen was positive in 87.4% in our study, but it is still less than all local and global studies.

Finally; E antigen was present only in 11.6% more than 2% (in Blacks), but lower than all local and global studies.

Our results close to previous study in black group may be Rajasthani population near to black ethnic group. Whatever, our results indicts that Rajasthani population are the best in the world because they don't have so much from antigens on RBCs, therefore they are good as donor.

V. CONCLUSION

Antigens database on blood donors are little in Raj-India. On the most blood banks the ABO and Rh D antigens are the main examined but other tests are not performed.

Moreover, India is full of its own specificities and multiple ethnic groups that are important to do for better care of patients by improving add tests like phenotyping RBCs of donors at least Rh & Kell, screening and identifying of antibodies in patients.

Our study, first step to make a rare donor antigens database bank and patients' antibodies also, to provide compatible blood to all multiple blood transfused, alloimmunized patients and enhance safety in transfusion medicine

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