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Analysis of RBC Antibody Screening in a Hospital Population Over a Two Years Period

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Abstract- RBC antibody screening plays an essential role in the pre-transfusion testing of the blood or blood products before blood transfusion in the recipients as well as in antenatal screening to prevent Rh-incompatibility. The antibody screening tests performed in a clinical laboratory / blood bank are designed to detect the presence of these unexpected antibodies especially all antibodies in the serum. Methods routinely used for detection of these antibodies are the Coomb's test (antihuman globulin test), both direct and indirect types.

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Analysis of RBC Antibody Screening in a Hospital Population Over a Two Years Period

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Abstract- **RBC antibody screening plays an essential role in the pre-transfusion testing of the blood or blood products before blood transfusion in the recipients as well as in antenatal screening to prevent Rh-incompatibility. The antibody screening tests performed in a clinical laboratory/blood bank are designed to detect the presence of these unexpected antibodies especially all antibodies in the serum. Methods routinely used for detection of these antibodies are the Coomb's test (antihuman globulin test), both direct and indirect types.**

I. Material & Methods

A total of 378 patients and 2050 donors were included in this study period of two years (July 2016 to June 2018) in the Department of Pathology, St. Stephens Hospital, New Delhi, India. All the hospital population (patients as well as donors) blood samples were included in the study. The antibody screening tests performed were Indirect Coomb's tests, Direct Coomb's tests and Auto control. The method of screening used was gel card technology.

II. Statistical Analysis

Qualitative variables are expressed as frequencies / percentages and compared between groups using Chi-square / Fisher's Exact Test. Quantitative variables are written regarding mean ± sd and compared using Unpaired t-test / Mann-Whitney Test. A p-value < 0.05 is considered statistically significant. The data is tabulated in MS Excel and analysis performed using Statistical Package for Social Sciences (SPSS) version 16.0 software.

a) Study Design

Cross-sectional study

b) Sample Size Determination

The formula used for sample size estimation was

$$\frac{n=Z\alpha^2P(1-P)}{d^2}$$

III. Result and Discussion

Our study included 378 patients and 2050 donors. The age of patients ranged from new born to 80 years with a mean age of 28.64 years. The maximum number of cases were in the age group of 21-30 years (58.20 %), followed by 31-40 years (19.84 %) and two cases were in the age group of 71-80 years (0.53 %). Female predominance was seen with a male to female ratio of 1:5.6. The most common causative factors in our study were the previous history of transfusion, females presented with pregnancy either primigravida or multigravida and Rh-negative blood group. Blood group B was the most frequent blood group followed by blood group O.

Table 1: Demographic Profile of the Study Population

Total Patients n = 378		
Gender Distribution		
Gender	**n**	**%**
Male	57	15.08%
Female	321	84.92%
Total	378	100%
Age Group (Years)		
Age (Years)	**n**	**%**
≤ 10	29	7.67%
11 – 20	16	4.23%
21 – 30	220	58.20%
31 – 40	75	19.84%
41 – 50	14	3.70%
51 – 60	13	3.44%
61 – 70	9	2.38%
71 – 80	2	0.53%
Total	378	100%
Mean ± sd	28.64	±12.13
ABO Blood Group		
Blood Group	**n**	**%**
A	88	23.28%
B	138	36.51%
AB	42	11.11%
O	110	29.10%
Total	378	100%
Rh D Distribution		
Rh D Positive	352	93.12%
Rh D Negative	26	6.88%

In our study ICT was positive in patients with mean age of 30.24 years, whereas DCT was positive in patients with mean age of 37.04 years and AC was positive with a mean age of 30.59 years.

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In our study, DCT was positive in 16 patients, and ICT was positive in 13 patients. Only two patients (0.53 %) had AC positivity. Out of 13 patients in which antibodies were detected by ICT, 10 (76.92 %) were females, and 3 (23.08 %) were males. Out of 57 male patients DCT was positive in 12 (21.05 %) which was 75 % of the total DCT positive rate. Whereas out of 321 female patients DCT was positive in only 4 (1.25 %) females which were 25 % of DCT positive rate.

In our study out of 2050 donors most common age group among donors was 21-30 years with 1126 (54.98 %) donors. Least common age group was 51-60 years with 25 (1.22 %) donors. Out of 2050 donors, 2019 (98.49 %) of donors were males. Only ten donors showed ICT positive rate which was 0.49 % of total antibody screening. No DCT positive cases were found.

Table 2: ICT Rate Analysis with Other Studies

Author	Year	Total Patients	All Immunised Patients (ICT Positive Cases)	The Rate of Alloimmunization (%)
Sirchia et al.[1]	1985	1432	74	5.2
Chow et al.[2]	1994	436	26	6
Choudhary et al.[3]	1999	81	8	9.8
Ansari et al.[4]	2007	80	3	3.75
Roopam et al.[5]	2009	96	5	5.21
Pahuja et al.[6]	2010	211	8	3.79
Nikam et al.[7]	2011	74	1	0.74
Usman et al.[8]	2011	800	30	3.75
Sood et al.[9]	2013	306	13	4.24
Makroo RN et al.[10]	2014	49,077	403	0.82
Present study	2018	378	13	3.44

The present study has an alloimmunization rate of 3.44% which is comparable to all the other studies mentioned above. A study by Nikam et al.[7] had least alloimmunization rate of 0.74 %. Choudhary et al. had the highest alloimmunization rate of 9.8%.[3] The percentage of alloimmunization in all the above-mentioned studies fall somewhere between <1% to 10%. According to published data rates of alloimmunization in random patients vary from 0 to 3 percent.[11] Pandey H et al. reported in his study that observational studies in random patients, who most often receive an incidental transfusion, and pregnant women estimated the prevalence between <1-3%.[12] This incidence increases in multi-transfused patients and transfusion-dependent patients. The reported prevalence of alloimmunization in multi-transfused patients in India is comparatively low varying from approximately 3% to 10%.[3,9,13]

Table 3: DCT Rate Analysis with Other Studies

Author	Year	Total Patients	All Immunised Patients (DCT Positive Cases)	The Rate of Alloimmunization (%)
Nakamura Y et al.[14]	1984	421	14	3.3
Pahuja S et al.[6]	2010	211	-	0.47
Valsami S et al.[15]	2015	2695	70	2.59
Present study	2018	378	15	4.23

DCT is the cornerstone of the diagnosis of hemolytic disease of the newborn (HDN). In our study, out of 378 patients, DCT was positive in 16 patients. The positivity rate of DCT in our study was 4.23%. Pahuja S et al. drawn similar results by DCT and had a 0.47% rate of immunization.[6] The Study by Nakamura Y et al. in 1984 had 421 samples of cord blood out of which 14(3.3%) positive results were obtained by direct antiglobulin test.[14] Study by Valsami S et al. published in 2015 had a result of the direct antiglobulin test positive rate of 2.59%.[15]

a) Analysis of Autocontrol in Patients

Out of 378 cases, two patients showed auto control positivity.

Out of 378 patients, AC was positive only in two patients, and those were females (0.53%). Among those two patients, one was Rh-positive and the another one was Rh-negative. History of previous transfusion (1.7%) is the most common cause of auto antibodies followed by pregnancy (0.43%). Similarly, in our study, one patient had history of transfusion and other was a pregnant female had auto control positive rate. It was

observed in our study that antibodies are more commonly found in the age group between 20-40 years. There is a paucity of literature on the detection of antibodies by auto control.

Table 4: Comparison of Donors with Other Similar Studies

Study	Year	Total Doners	All Immunised Doners (ICT Positive)	The Rate of Alloimmunization (%)
Pahuja S et al.[16]	2013	7756	4	0.05
Garg N et al.[18]	2014	47450	46	0.09
Makroo RN et al.[17]	2018	82153	227	0.27
Present study	2018	2050	10	0.49

In our study, only ten donors had antibodies in their blood (0.49%). Makroo RN et al. drawn similar results in his study in which out of 82153 donors 227(0.27%) had antibodies in their blood.[17] The study by Pahuja S et al. had a total of 7756 donors out of which 4(0.05%) donors had antibodies in their blood.[16]Garg N et al. had a similar result of 0.09% antibodies in 47450 donors.[18] The blood with antibodies were discarded and not transfused to patients.

IV. Conclusion

Clinically significant antibodies were frequently detected in our patients and donors population. Alloimmunization in Rh D positive women was low as compared to Rh D negative women. The previous history of transfusion was an important cause for the development of antibodies. Males were more than females in donor population which showed that males are more active in donating the blood.

We recommended that

- Antibody screening must be done both in patients and donors to find the irregular antibodies.
- Antibody screening should be done in pregnant females to prevent Rh incompatibility or HDFN.
- Antibody screening should be done in donors to detect the presence of alloantibodies and is an important to provide compatible blood products and to avoid transfusion reactions.
- Multi-transfused patients have a high probability of developing alloantibodies, so extended screening is recommended in the patients to prevent hemolytic transfusion reactions.

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