FREQUENCY OF ABO AND RhD BLOOD GROUPS IN TRANSFUSION DEPENDENT PATIENTS

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ABSTRACT

Objective: To study the frequency of ABO and RhD blood groups in patients with various haematological disorders requiring repeated blood transfusion.

Material and Methods: Two hundred (200) subjects requiring regular blood transfusion suffering from various haematological disorders i.e. Thalassaemia, Haemophilia, Aplastic Anaemia and patients with Chronic Renal Failure undergoing haemodialysis, were selected and analyzed to detect the ABO and RhD blood groups. The investigation included standard blood grouping tube method.

Results: The commonest blood group observed was “B” (31%), the next commonest groups were “O” (27%) and “A” (27%) and “AB” (15%). The Rh-positive were 94% and Rh-negative were 6%.

Conclusion: Various haematological disorders are quite common. Some of these are congenital e.g. Thalassaemia, Haemophilia and some of them are acquired e.g. Aplastic Anaemia, Chronic renal Failure. These disorders develop regardless of the blood groups. The frequency of ABO and RhD blood groups are related to the blood groups of the specific geographical or ethnic population.

Key words: ABO and RhD blood groups, Transfusion dependent disorders.

INTRODUCTION

People have always been fascinated by blood; ancient Egyptians bathed in it. Aristocrats drank it, authors and playwrights used it as themes and modern humanity transuses it. The road to an efficient, safe and uncomplicated transfusion technique has been rather difficult, but good progress has been made 1. Transfusion support is vital to the management of patients with hematol-
logical disorders and malignancies. Many such patients require blood transfusion during the course of their illness. Blood transfusion is a risky operation as it is potentially dangerous form of therapy. Some patients may accept the blood transfusion of other peoples without any side effects, while others, transfusion may lead to serious reactions. Blood transfusion poses serious problems like haemolysis, which can be immediate due to ABO and Rh incompatibility or delayed due to minor blood groups abnormalities also called unexpected alloantibodies.

The immunological era of blood transfusion was introduced in 1900, when Karl Land Steiner discovered the blood groups by noting the agglutinating properties of the erythrocytes of some persons with the serum of others.

In 1901, Land Steiner drew blood from himself and five other associates, separated the cells and the serum, and then mixed each cell sample with each serum. He was inadvertently the first individual to perform forward and reverse grouping. In 1902, Land Steiner's associate, Sturle and Von Descatello, discovered the fourth ABO blood group, AB.

Coincidently, the discovery of the Rh groups in 1940, by Land Steiner and Wiener, and their associates with haemolytic disease of the newborn, was the beginning of the extraordinary development of blood group serology.

The antigenic composition of red cells is important in transfusion therapy. In man 23 blood group systems with 203 antigens have been identified so far. In routine transfusion practice, tests determine the compatibility of the clinically significant blood group antigen of the donor and the recipient. Antibodies reacting with red cell antigens can cause serious clinical problems, including haemolytic transfusion reactions (HTR), haemolytic disease of the new born (HDN), and autoimmune haemolytic anemias.

Numerous literature has been published specially in recent years to map the geographical distributions of blood groups. Proper understanding of human blood group system has made safe transfusion possible.

The ABO blood group system, which was first human blood group system to be discovered, remain the most important in transfusion practice. This is because of the regular occurrence of antibodies anti-A, anti-B and anti-A, B reactive at 37°C, in persons whose red cells lack the corresponding antigen, so that if transfusion were to be given without regard to the ABO groups about one third would be incompatible.

The term "blood group" is applied to the genetically determined antigen that can be detected on the red cell surface by specific antibodies. Antigen composition of red blood cells is important in transfusion therapy. In man, 100 blood group systems composed of 500 antigens have been identified so far. Some of the blood group system beside 'ABO' and 'Rh' are MNS, P, Kell, Kidd, Duffy, Lutheran, Li systems.

Human red cell contains on their surface a series of glycoproteins and glycolipids, which contain the blood group antigens. The development of these blood groups is controlled; they appear early in fetal life and remain unchanged until death.

The plasma contain antibodies against the absent antigens, i.e people with blood group A have antibodies to B in their plasma. Their antibodies are formed against cross-reacting, bacterial or food antigens are first detectable in 3 – 6 months of age and are of IgM class. Individuals are tolerant to their own blood group antigens, so that a person with blood group A does not form antibodies to A antigen. The end result is
TABLE 1

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Place of Study</th>
<th>Year of Study</th>
<th>No. Studied</th>
<th>A</th>
<th>B</th>
<th>O</th>
<th>AB</th>
</tr>
</thead>
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<tr>
<td>Contreras and Lubenko</td>
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<td>1999s</td>
<td>190770</td>
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<td>Shah11</td>
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<td>1989</td>
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<td>21.29</td>
<td>29.68</td>
<td>40.00</td>
<td>9.03</td>
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<td>1039</td>
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<td>8.00</td>
<td>36.00</td>
<td>9.00</td>
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<td>1997</td>
<td>13583</td>
<td>24.31</td>
<td>37.25</td>
<td>29.77</td>
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<td>28.17</td>
<td>37.78</td>
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<td>Babar et al 14</td>
<td>Nowshera</td>
<td>1995</td>
<td>————</td>
<td>27.12</td>
<td>31.04</td>
<td>29.80</td>
<td>11.04</td>
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</table>

The ABO system contains four blood groups and is determined by the presence or absence of two distinct antigen A and antigen B, cells of B have antigen B and cells of group AB have both A and B antigens, while group O cells have neither A nor B antigen. The four groups are also distinguished by the presence or absence of two distinct antibodies in the serum specific for the antigen that is absent on the red cell. The serum of a group A individual has anti-B antibody, group B has anti-A and group O individuals have both anti-A and anti-B, while in the group AB both anti-A and anti-B are absent. Individuals who possessed the A antigen on their red cell also possessed anti-B in their serum; individuals who possessed the B antigen had anti-A in their serum; individuals who possessed neither A nor B antigens (group O) had both anti-A and anti-B in their serum; and individuals with both A and B antigens (group AB) had neither anti-A nor anti-B in their serum.

The ABO system is crucial in clinical blood transfusion, as there are naturally occurring IgM antibodies in the serum targeted against the non-present ABO antigens. These antibodies necessitate the use of ABO-compatible 'blood for transfusion'. Antibodies to other red cell antigen appear only after sensitization. They are usually IgG.

This system is of clinical importance as a major mismatched transfusion A into O or B; B into O or A; AB into O, A or B, can produce a serious haemolytic transfusion reactions with destruction of the transfused cells. HDN of ABO incompatibility is clinically milder than that of Rh incompatibility, severe haemolysis occasionally occurs, and some require exchange transfusion. Cord blood levels more than 4 mg/dl or positive DAT are high risk category.

**Material and Methods**

Total of 200 transfusion dependent subjects with known diagnoses were selected. Among these 140 subjects were thalassaemics, 20 haemophiliacs, 20 cases of aplastic anaemia and 20 patients with chronic renal failure undergoing haemodialysis.
RH BLOOD GROUP PREVALENCE IN VARIOUS POPULATION

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Place of Study</th>
<th>Year of Study</th>
<th>No. Studied</th>
<th>Rh+ve</th>
<th>Rh-ve</th>
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<td>1997</td>
<td>32995</td>
<td>91.00</td>
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<td>Babar et al 14</td>
<td>Nowshehra</td>
<td>1995</td>
<td>4510</td>
<td>92.88</td>
<td>7.12</td>
</tr>
</tbody>
</table>

TABLE - 2

ml of venous blood was collected from each of the subjects through a clean venipuncture. 2.0 ml blood was mixed with Potassium EDTA to a final concentration of 1.5 mg/ml and used for blood grouping.

Inclusion Criteria

1. Patients with diagnosed haematological disorders.
2. Patients who have received at least five transfusions with in last six months.

RESULTS

About 200 multitransfused patients from different transfusion centers and hospitals were screened to seen the pattern of frequency of ABO and RhD blood groups in patients repeatedly in need of blood transfusions. The blood group A was 54/200(27%), B 62/200(31%), AB 30/200 (15%) and O was 54/200(27%). (Table 3 and fig 1). The Rh +ve subjects were 188/200(94%) and Rh -ve subject were 12/200 (6%). The frequency of ABO and Rh blood group accordingly are shown in table 4.

DISCUSSION

Allogeneic blood transfusion is a form of temporary transplantation. This procedure introduces a multitude of foreign antigens and living cells into the recipient that will persist for a variable amount of time. The antigenic composition of red cells is important in transfusion therapy. In routine transfusion practice, tests determine the compatibility of the clinically significant blood group antigen of the donor and the
frequency of ABO and RhD blood groups in transfusion dependent patients

TABLE - 4

<table>
<thead>
<tr>
<th>ABO Blood Groups</th>
<th>Rh Positive</th>
<th>Thalassaemia</th>
<th>Haemophilia</th>
<th>Chronic Renal Failure</th>
<th>Aplastic Anaemia</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>+ve</td>
<td>35</td>
<td>04</td>
<td>03</td>
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</tr>
<tr>
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</tr>
<tr>
<td>B</td>
<td>+ve</td>
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<tr>
<td>O</td>
<td>+ve</td>
<td>37</td>
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<td>01</td>
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</tbody>
</table>

recipient. Antibodies reacting with red cell antigens can cause serious clinical problems, including haemolytic transfusion reactions (HTR), haemolytic disease of the new born (HDN), and autoimmune haemolytic anaemias.

In different ethnic groups, the pattern of inheritance of blood group and effect of different factors (genetic drift) migration and breeding pattern affecting the ABO alleles (table 1) 9,10,11,12,13,14. The Rh blood group system is second in importance to ABO in transfusion practice. It is the most polymorphic of the human blood groups; forty five Rh system antigens have been defined. Rh blood group prevalence in various populations is shown in (table 2) 11, 12,13,14,15. The purpose of this study was to find out the frequency of ABO and Rh blood group among the patients dependent on regular blood transfusion.

Khaskheli reported group “B” in 31% and blood group A in 25% 12, Babar et al (1999) reported blood groups in district Nowshehra (NWFP). The prevalence in this study was “B” in 34.4%, “O” in 29.8%, “A” in 27.1% and “AB” in 11% 14. Janjua et al (1997) reported blood group “B” in 36.98%, “O” in 24.24% and “AB” in 9.01 15. These observations are very close to the findings of present study. Where as Bhatti and Sheikh (1999) reported blood group “O” in 37.78%, “B” in 28.17%, “A” in 25.83% and “AB” in 8.3% 9. Shah (1999) also reported “O” being commonest blood group was found in 40%, “B” in 29.68%, “A” in 21.29% and “AB” in 9.03 11. Summary and comparison with different studies are given in table no 1 and 3.

The Rh blood group system is one of the most polymorphic and immunogenic systems known in humans. It is also important because of its capacity of the antibodies of this system to cause sensitive, immune haemolysis and haemolytic disease of the new born. Human red cell can be subdivided into Rh positive and Rh negative
according to whether the Rh (D) antigen is present or not, but usually a more complete phenotype includes a determination of the presence of Rh C, c, E, and e antigens, which are defined by two pairs of antisera giving antithetical reactions\(^2\).

In present study 94% subjects were Rh-positive and only 6% subjects were Rh negative. Babar et al. (1999) reported 92.88 cases of Rh positive and 7.12% of Rh negative\(^8\). Janjua et al. (1997) reported Rh positive 91.9% and Rh negative 8.1%\(^9\). These finding are quite similar with the results of present study. Rh blood group prevalence in various populations is shown in table 2 and 4.

There was no relationship established in association with the disorder leading to repeated blood transfusion. The difference between the prevalence is mainly due to geographical and ethnic distribution of the population.

**Conclusion**

The commonest blood group observed in this study is “B” (31%), the other common groups in the descending orders are “O” (27%) and “A” (27%) and “AB” (15%). The Rh-positive were 94% and Rh-negative were 6%.

**References**


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