Frequency of ABO, Subgroup ABO and Rh(D) Blood Groups in Major Sudanese Ethnic Groups

Fathelrahman Mahdi Hassan

College of Medical laboratory Science, Sudan University of Science and Technology, Khartoum–Sudan.

Abstract

Background: There are differences in the distribution of ABO, subgroup ABO and Rh(D) blood groups in different populations of the world. Relatively little information is available about blood group distributions in Sudanese population.

Objectives: To see the frequency of ABO, subgroup ABO and Rh(D) blood groups in major Sudanese ethnic groups (Danagla, Shaygia and Gaaleen).

Subjects and Methods: Blood testing for ABO, subgroup ABO and Rh(D) typing was done over six months, in 300 unrelated individuals, from both genders. Blood samples were collected from students of the college of medical laboratory science – Sudan University of Science and Technology using finger prick method and following routine slide method.

Results: Blood group "O" was the most predominant (52.7%) in both Rh positive and negative subjects, followed by blood group A, B and AB. Majority (98.0%) of the subjects were Rh(D) positive and only 2% were Rh negative. The predominant subgroup of ABO was A2 (14.1%).

Conclusions: The frequency of ABO blood groups in both Rh positive and negative subjects among the major Sudanese ethnic group was similar to that reported from neighbouring regions.

Key words: ABO, subgroup ABO, Rh(D), blood groups.

Introduction

The discovery of the ABO blood groups by Karl Landsteiner was an important achievement in the history of blood transfusion followed by discovery of Rh(D) antigen. The genes of ABO and Rh(D) are located on chromosome 9 and 1 respectively. The bombardment of the red blood cells with A and/or B antigens occurs because of the action of the glycosyltransferases enzymes that add specific sugars to the precursor substance. However, a group of conformation-dependent epitopes along the Rh(D) protein form the D antigen. The Landsteiner’s discovery opened the door to the birth of a wide spectrum of discoveries in the field of immunohaematology. Blood transfusion among humans irrespective of their natives, unmatched-pregnancy, legal medicine, anthropology and the discovery of other blood group systems, all are deemed as...
an applications or as a result of Karl’s discovery.

There are differences in the distributions of ABO, subgroup ABO and Rh(D) blood groups among different populations of the world\textsuperscript{7-17}. The study of blood grouping is important as it plays an important role in genetics, blood transfusion and forensic pathology. Blood group has some association with diseases like duodenal ulcer, diabetes mellitus, urinary tract infection, Rh incompatibility and ABO incompatibility of newborn\textsuperscript{18}.

The present study was done to document the frequency of ABO, subgroup ABO and Rh(D) in major Sudanese Ethnic Groups (Danagla, Shaygia and Gaaleen).

**Subjects and Methods**

The study was done in students at the College of Medical Laboratory Science, Sudan University of Science and Technology, Khartoum State, Sudan. Over six months period, a total of 300 unrelated individuals of both genders belonging to the major Sudanese ethnic group (Danagla, Shaygia and Gaaleen), were selected. Sample size was calculated using the approximate proportion to population size in Khartoum state. Blood samples were collected from the college of medical laboratory science, Sudan University of Science and Technology, and relevant data were collected from the students after taking consent from the college of medical Laboratory science. Confidentially, of the data were maintained.

Each student, who accepted to participate in the study, received three sheets, (consent form, finger puncture form and questionnaire). The first sheet was a declaration form for each participant that she/he understood the project well, the second included information about the procedures of ABO, subgroup ABO and Rh(D) blood groups and that the student was physically and mentally sane to participate in the project, the third sheet was, a questionnaire that included demographic data of the participants. The blood samples were collected by finger prick with sterile lancet and after warming and cleaning the puncture site with 70% ethyl alcohol. A drop of monoclonal anti-A, anti-B, monoclonal/polyclonal anti-D, anti-A1 and anti A1B (DiMed, UK) was added to a drop of finger prick blood on clean slide and mixed well. Results of agglutination were recorded immediately for ABO blood groups and after 2 minutes in Rh(D).

**Results**

The distribution of ABO blood groups in both Rh(D) positive and negative subjects are shown in Table-1. Overall blood group O was the commonest (52.7 %), followed by A (23%), B (13%) and AB (10.8%). Table 1 shows the subgroup A2 (14.10%) and A1B (7.2%) that were high among groups A and AB respectively.

**Table 1:** Spectrum of Blood groups ABO and Rh (D) in major Sudanese ethnic population. (n-300)

<table>
<thead>
<tr>
<th>Blood group spectrum</th>
<th>Nos (%)</th>
<th>Rh (D) (%)</th>
<th>Rh(D) –ve (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>158 (52.7)</td>
<td>153 (51.0)</td>
<td>5 (01.77)</td>
</tr>
<tr>
<td>A</td>
<td>70 (23.3)</td>
<td>69 (23.3)</td>
<td>1 (0.3)</td>
</tr>
<tr>
<td>A1</td>
<td>28 (09.2)</td>
<td>28 (09.2)</td>
<td>0</td>
</tr>
<tr>
<td>A2</td>
<td>42 (14.1)</td>
<td>42 (14.1)</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>40 (13.2)</td>
<td>40 (13.2)</td>
<td>0</td>
</tr>
<tr>
<td>AB</td>
<td>32 (10.8)</td>
<td>32 (10.8)</td>
<td>0</td>
</tr>
<tr>
<td>A1B</td>
<td>21 (07.2)</td>
<td>21 (07.2)</td>
<td>0</td>
</tr>
<tr>
<td>A2B</td>
<td>11 (03.6)</td>
<td>11 (03.6)</td>
<td>0</td>
</tr>
</tbody>
</table>


**Discussion**

The need for blood group prevalence studies in Khartoum, Sudan is important not only for blood transfusion, organ transplantation but also in future genetic research and in evolving evolution’s branching tree.

In the present study, blood group O was the predominant (52.7%) while AB was the least common (10.8%). This finding is in agreement with the only study done by Abo Algasim et al. In Aldinga Sudanese Ethnic group, where the workers reported highest frequency of blood group phenotype O (50%) followed by A (23%), B (18%), and AB (9%). Comparing the Sudanese blood groups with other countries around the region, Saudi Arabia shows the same picture, while Egypt although shows high blood group O but A blood group is also almost equal to A, while B is higher. Syria and Jordan show a different picture where blood group A is more common than O. (Table-2) This difference in spectrum may have resulted due to sampling error, genetic factors natural selection which is affected by traditions and habits (exogamy, endogamy).

**Table 2: Comparison of distribution of ABO blood groups between present study and some neighbor countries.**

<table>
<thead>
<tr>
<th>ABO Spectrum</th>
<th>O %</th>
<th>A %</th>
<th>B %</th>
<th>AB %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present study</td>
<td>52.7</td>
<td>23.3</td>
<td>13.2</td>
<td>10.8</td>
</tr>
<tr>
<td>Egypt</td>
<td>36.44</td>
<td>33.94</td>
<td>20.96</td>
<td>8.65</td>
</tr>
<tr>
<td>Saudia Arabia</td>
<td>52</td>
<td>24</td>
<td>17</td>
<td>4</td>
</tr>
<tr>
<td>Syria</td>
<td>37.5</td>
<td>46.25</td>
<td>13.13</td>
<td>3.12</td>
</tr>
<tr>
<td>Jordan</td>
<td>36.62</td>
<td>38.36</td>
<td>18.04</td>
<td>6.98</td>
</tr>
</tbody>
</table>

Rh(D) positive individuals were high in this study and this is in agreement with previous studies. The present study is the first comprehensive study that documents the frequencies of ABO, subgroup ABO and Rh (D) blood groups among Sudanese ethnic group in Khartoum. From our viewpoint, this could have a significant implication to the major national central blood bank at Khartoum state teaching hospitals in Sudan, where certain blood groups are needed more than others in emergency conditions. In addition, this study will give the chance to researchers to explore the reasons of increasing of one blood group to another by linking it to genetic influences and effects of consanguineous marriages.

**Acknowledgments**

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**References**

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