Distribution pattern of ABO and Rhesus blood groups among different ethnic population of Karachi

Mubashir Ahmed, Ashraf Memon, Khalid Iqbal

Introduction
The ABO system was the first human blood group system, discovered in 1901. Later, the fourth type AB was added in 1902. Blood groups are classified into types A, B, AB and O in the ABO system. In 1941, the Rhesus (Rh) blood group system was defined having Rh-positive and Rh-negative streams based on the presence or absence of inherited antigenic substances, like proteins, carbohydrates, glycoproteins and glycolipids, on the surface of the red blood cells (RBCs).

ABO and Rh blood group systems are important for safe blood transfusion and organ transplantation purposes. In addition, these two systems are well established in population genetic studies, population migration patterns, deciding forensics and disputed paternity issues. Moreover, studies have found associations between certain diseases and the ABO and Rh blood group systems.

The frequencies of ABO blood groups vary from one population to another, and time to time in the same region distribution of these blood groups is different in different races. The knowledge of distribution pattern of ABO and Rh blood groups at local and regional levels is very important in the effective management of blood banks and safe blood transfusion services. Therefore, there was a need to determine the distribution pattern of ABO and Rh blood groups in different ethnic populations of Karachi.

Karachi ranks 6th among the 10 most populated cities of the world, with a population density of 14.9 million. Karachi has most diversified population and Kharadar General Hospital, located in the old city area, caters to nearly all representative ethnic groups. Previous studies on distribution pattern of blood groups in Pakistan did not report ethnicity in relation to blood groups distribution pattern. The current study was planned to determine the distribution pattern of ABO and Rh blood groups among different ethnic groups living in Karachi.

Subjects and Methods
The retrospective cross-sectional study was conducted at Kharadar General Hospital (KGH), Karachi, from May to Dec 2017, and comprised antenatal patients and walk-in male individuals of different ethnic groups who were tested at the hospital's clinical laboratory. The antenatal attendees were included because blood grouping services from the clinical laboratory was mostly availed by pregnant women who came on antenatal visits. After approval from the institutional review board, convenient sampling was employed to raise the sample and subjects from Balochi, Pathan, Mohajir, Sindhi, Kutchi, Punjabi, Memon, Hindko, Bengali and Seraiki ethnic groups were
enrolled after taking consent.

Venous blood sample was collected from each participant through venepuncture, using 5ml disposable syringe which was emptied into the ethylenediaminetetraacetic acid (EDTA) (Purple top) Vacutainer tubes. Blood grouping of ABO and Rh typing were performed through conventional slide agglutination (antigen-antibody) method. Blood drops were placed on a cleaned tile at three places, then a drop of antiserum A, B and anti-D (SeraconetM * by Bio-Rad Laboratories, Inc. Germany) was added and mixed with each blood drop using plastic stirrer. Blood was mixed thoroughly with the antiserum and rocked gently for 1 minute to observe agglutination. In case of doubt, the test was confirmed by reverse grouping, using known group A and B cells.16

SPSS 16.0 was used for data analysis descriptive statistics, including frequencies and percentages of ABO and Rh blood groups, were calculated. Pearson’s Chi-square test was used to see the correlation between gender and blood groups/types. P<0.05 was considered statistically significant.

Results

Of the 3521 subjects, 3187(90.5%) were females and 334(9.5%) were males. Overall, 1253(35.6%) subjects had blood group O, 1167(33.1%) group B, 849(24.1%) group A and 252(7.2%) had group AB. Also, 3209(91.1%) were Rh-positive and 312(8.9%) Rh-negative (Table-1). There was no significant difference between male and female blood groups in ABO (p=0.71) and Rh (p=0.61) distribution patterns.

The biggest ethnic group was Balochi 932(26.5%), followed by Pathan 597(17%), Mohajir 550(15.6%), Sindhi 386(11%), Kutchi 336(9.5%), Punjabi 332(9.4%), Memon 212(6%) Hindko 88(2.5%), Bengali 56(1.6%) and Serai 32(0.9%). Blood group O-positive was predominant in Balochi 381(41%), Mohajir 197(36%), Sindhi 147(38%), Hindko 39(44%) and Serai 14(43.8%) groups, while B-positive was common among Pathan 597(35%), Punjabi

<table>
<thead>
<tr>
<th>Ethnic groups</th>
<th>Rh Positive N (%)</th>
<th>Rh Negative N (%)</th>
<th>Total N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balochi</td>
<td>858 (92.1)</td>
<td>74 (7.9)</td>
<td>932 (26.5)</td>
</tr>
<tr>
<td>Pathan</td>
<td>534 (89.4)</td>
<td>63 (10.6)</td>
<td>597 (17.3)</td>
</tr>
<tr>
<td>Mahajir</td>
<td>503 (91.5)</td>
<td>47 (8.5)</td>
<td>550 (15.6)</td>
</tr>
<tr>
<td>Sindhi</td>
<td>352 (91.2)</td>
<td>34 (8.8)</td>
<td>386 (11.0)</td>
</tr>
<tr>
<td>Kutchi/Khati</td>
<td>292 (86.9)</td>
<td>44 (13.1)</td>
<td>336 (9.5)</td>
</tr>
<tr>
<td>Punjabi</td>
<td>304 (91.6)</td>
<td>28 (8.4)</td>
<td>332 (9.4)</td>
</tr>
<tr>
<td>Memon</td>
<td>202 (95.3)</td>
<td>10 (4.7)</td>
<td>212 (6.0)</td>
</tr>
<tr>
<td>Hindko/Hazara</td>
<td>78 (88.6)</td>
<td>10 (11.4)</td>
<td>88 (2.5)</td>
</tr>
<tr>
<td>Bengali</td>
<td>56 (100)</td>
<td>0 (0.0)</td>
<td>56 (1.6)</td>
</tr>
<tr>
<td>Serai</td>
<td>30 (93.7)</td>
<td>2 (6.3)</td>
<td>32 (0.9)</td>
</tr>
<tr>
<td>Total</td>
<td>3209 (91.1)</td>
<td>312 (8.9)</td>
<td>3521 (100.0)</td>
</tr>
</tbody>
</table>
Variation in distribution pattern of ABO blood group was also reported by different countries. Consistent to current findings O>B>A>AB has been reported by multiple studies from various countries. Contrasting results of
blood group ABO distribution pattern to have also been reported by studies.20-22 Higher proportion of Rh-negative blood was observed in the United States as 17%22 and Iran 10%.24 In Pakistan, Rh-negative frequency has varied from 5.4% to 10.7%.25 Gender-based variation in the distribution pattern of blood groups ABO and Rh was not significant in the current study. More than 90% participants were female, with the female-to-male ratio being 10:1. Therefore, gender-based independent ethnic distribution pattern of the blood groups was not analysed.

The main limitation of the current study was its use of convenient sampling which led to a predominance of antenatal visitors. Another limitation was unequal proportion or unequal sample size of the ethnic groups. It was because Balochi, Mahajir and Pathan individuals who live around KGH were usually the most frequent visitors to the study site. However, the study is significant especially for blood banks and local hospitals of the area providing blood transfusion services. The blood grouping study will help in efficient delivery of safe blood transfusion services to the communities, particularly during emergency situations like road traffic accidents (RTAs), natural disasters, and other health emergencies. Study findings will also encourage relevant authorities to frame better national blood transfusion policy.

**Conclusion**

O-positive was the most common and AB-negative was the least common blood group among different ethnic groups of Karachi. Blood grouping information may be vital for different stakeholders, including blood banks and hospitals. This information will help in timely availability of the required blood groups, particularly during emergency, for the different ethnic groups.

**Disclaimer:** None.

**Conflict of Interest:** None.

**Source of Funding:** None.

**References**