INTRODUCTION
Discovery of Landsteiner ABO group system provided a major breakthrough in transfusion system. The four main blood groups validated till date are A, B, AB and O.1 Subgroups in the ABO system results from polymorphism in the genes coding for ABO group.2Two main subgroups of A group based on the Anti A1 lectin reactivity are A1 and A2. A1 reacts with anti A1 whereas A2 does not show any agglutination with anti A1 lectin. Frequency of A subgroup varies greatly in Indian population. Around 80% of blood group A and AB population are A1 and A1B respectively while the remaining 20% of the population are either A2 or A2B. 3,4 Rarely few individuals with subgroup A either show very weak reactivity or no reactivity with A antisera. These individuals are categorized as weaker subgroups. These weaker subgroups sometimes pose problems in ABO grouping.5

ABSTRACT
Background & Aims: The genes coding for A blood group show polymorphism resulting in formation of subgroups. A1 and A2 are two main subgroups of A blood group. These are clinically significant when A1 antibodies react at 37°C. Till date, very few studies have been done on the prevalence of subgroup of A blood group among healthy donors and its importance in transfusion medicine and immunohematology. The aim of the study was to find the prevalence and clinical significance of A1 and A2 subgroups in healthy blood donors of Western Rajasthan.

Methods: The prospective cross sectional observational study enrolled blood donors for blood grouping by using tube method from Jan 2017 to Jan 2018. Further sub grouping for A and AB group was done using Anti A1 lectin. Based on agglutination reaction A and AB groups were typed into A1, A2, A1B and A2B.

Results: A total of 11,624 blood donors were analyzed for ABO and Rh grouping. Among 11,624 blood donors A antigen (A & AB blood group) was present in 3486 (29.98%) blood donors. Of 3486 blood donors 2444 (21.02%) belong to A group and 1042 donors (8.9%) belong to AB group. of these 2444 A group donors, 2402 (98.2%) belong to A1 and only 42 (1.7%) belong to A2. Of 1042 donors with AB group 956 (91.5%) belong to A1B and 86 (8.25%) belong to A2B blood group. 8138 (70.01%) donors were other than A and AB blood group.

Conclusion: Present study showed that A1 and A1B subgroups are the most prevalent in A and AB groups respectively. A2B sub group occur more frequently than A2 subgroup.

Keywords: Transfusion Medicine, Blood Donors, Agglutination, Blood group antigens
A1 antibody appear as an atypical cold agglutinin, however it becomes clinically significant when react at 37°C and leads to destruction of A1 cells. Around 0.4% of A2 and 25% of A2B individuals show presence of these antibodies. These antibodies cause difficulty in interpretation of blood groups which may sometimes cause transfusion reaction. The present study aimed to find the prevalence of A1, A1B, A2 and A2B subgroups in Western Rajasthan and their clinical implications in transfusion medicine.

**METHODS**

This was a prospective cross sectional observational study, which enrolled blood donors for blood grouping from Jan 2017 to Jan 2018 at Umaid Hospital blood bank. The donor red cells were washed three times with 0.9% saline. For forward grouping, monoclonal antisera Anti A, Anti B and anti D were used. One drop of 5% suspension of donor red blood cells was mixed with two drops of antisera and centrifuged for 1 minute at 1000 rpm. Test results were examined microscopically. For further sub classification of A and AB blood groups into A1, A2, A1B and A2B, Anti A1 lectin was used. Reverse grouping was performed using slide method. Pooled A, B and O cells were made. Interpretation of blood groups was done on the basis of agglutination reaction seen with both forward and reverse grouping.

**STATISTICS**

Data were entered in Microsoft excel sheet version 10. The proportions of data were calculated among different groups. The proportions of A1 and A2 were calculated out of A blood group while proportions of A1B and A2B were calculated out of AB blood group. The data were also presented graphically.

**RESULTS**

A total of 11,624 healthy donors were enrolled for the study. Out of total study sample, A antigen was present in 3486 donors (29.98%). Of these, 2444 (21.02%) belonged to A group and 1042 (8.9%) belong to AB group. A1 antigen was present in 2402 (98.28%) and A2 was present in 42 (1.72%). A1B and A2B was found in 956 (91.75%) and 86 (8.25%) donors respectively (Table 1; Figure 1,2). 207 (5.94%) donors with A antigen were Rh negative. Of these 207 donors, 122 (58.94%) were A negative and 85 (41.06%) AB negative (Table 2). No weaker sub groups was found in the study. Blood groups other than A and AB was found in 8138 donors.

**DISCUSSION:**

ABO blood grouping system was first introduced by Karl Landsteiner in early 20th century. Since then it has played a major role in transfusion medicine. Heterogeneity in the genes coding for A gene results in formation of subgroups. A1 and A2 are the major subgroups of A group. These subgroups can result in disparities in ABO grouping. Individuals with A2 subgroup have specific anti A1 antibody. These antibodies do not react with A2 red cells however they recognize A1 red cells as foreign antigen and cross react with them. According to our study results the prevalence of A2 and A2B in Western Rajasthan population was 1.22% and 8.25%. These findings were similar to those seen in Japanese and black population where frequency of A2B is
higher than A2 subgroup. Higher frequency of A2B in black population has been attributed to presence of strong B genes which subdue the activity of A1 antigen. In a study done in Karnataka by Shastri et al, the prevalence of A2B and A2 was found to be 10.5% and 1.85% respectively. Shastri et al (2012) from Andhra Pradesh found 4.1% A2 and 19.2% A2B subgroup prevalence in the study conducted by them. Mehra Ruhi et al (2016) from Maharashtra found prevalence of A2 and A2B 1.6% and 9.68% respectively while the prevalence of A1 and A1B was 98.3% and 9.32% respectively. In Hiroshima A2 individuals comprised 0.17% of A group population while A2B individuals were 1.14% of AB type population. In Nagasaki prevalence of A2 and A2B individuals was found to be 0.08% and 2.44% respectively. These findings closely correlated with our study findings. In our study 98.28% donors of A blood group belong to A1B while 8.5% donors belong to A2B subgroup. In a study conducted by Sharma et al in 2013 in Greater Gwalior region of India and Hassan in Sudanese population the prevalence of A2B was similar to that in our study however the prevalence of A2 was higher in both the studies being 8% and 14.10% respectively. The prevalence of A2 negative in present study was 0.14% and A2B negative was 0.25%. A1 negative was prevalent in 0.14% and A2B negative in 0.25%. In a study done by Sujata S. Giriyan et al, A2 negative was prevalent in 0.004% and A2B negative in 0.014%. This study helps to link Rh status of the individuals with A and AB subgroups.

**CONCLUSION:**

This is the first prevalence study of A subgroup conducted in Western Rajasthan population. The two major subgroups of A blood group are A1 and A2. These subgroups cause difficulties in interpretation of ABO grouping which may sometimes lead to lethal transfusion reaction. Hence, all A and AB blood group donors should be tested for anti A1 sera. It will improve overall performance of blood transfusion and also prevent transfusion reaction.

**REFERENCE:**


6. Boorman KE, Dodd BE, Loutit JF, Mollison PL. Some results of transfusion of blood to


Figure 1 legends: Distribution of A1 and A2 subgroup among A group (%)

Figure 2 legends: Distribution of A1B and A2B subgroup among AB group (%)

Table 1: Distribution of A and AB Subgroup Among A and AB Groups

<table>
<thead>
<tr>
<th>Blood Group</th>
<th>Number</th>
<th>Subgroup</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2444</td>
<td>A₁</td>
<td>2402</td>
<td>98.28%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A₂</td>
<td>42</td>
<td>1.72%</td>
</tr>
<tr>
<td>AB</td>
<td>1042</td>
<td>A₁B</td>
<td>956</td>
<td>91.75%</td>
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<tr>
<td></td>
<td></td>
<td>A₂B</td>
<td>86</td>
<td>8.25%</td>
</tr>
<tr>
<td>Total</td>
<td>3486</td>
<td></td>
<td>3486</td>
<td></td>
</tr>
</tbody>
</table>

Values expressed as number and percentage

Table 2: Distribution of A and AB Negative Subgroups

<table>
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<tbody>
<tr>
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</tr>
<tr>
<td>A₂ Negative</td>
<td>5</td>
</tr>
<tr>
<td>A₁B Negative</td>
<td>76</td>
</tr>
<tr>
<td>A₂B Negative</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>207</td>
</tr>
</tbody>
</table>

Values expressed as numbers