FREQUENCY OF KELL ANTIGENS (K & K) AMONG BLOOD DONORS OF NORTHERN PAKISTAN

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ABSTRACT

Objective: To determine the frequency of Kell blood group antigens (K and k) in blood donors from northern Pakistan.

Study Design: Cross sectional study.

Place and Duration of Study: The study was carried out at immunohaematology department of Armed Forces Institute of Transfusion (AFIT) Rawalpindi, Pakistan, from 1st Nov 2017 to 31st Dec 2017.

Methodology: After approval of Ethical Committee of Armed Forces Institute of Transfusion (AFIT) Rawalpindi, the blood samples of 2000 blood donors were collected. Samples were selected by non-probability consecutive sampling technique. After preliminary blood grouping for ABO and Rh D, these samples were phenotyped for K (kelleher) and k (celleno) antigens. Typing was performed on Biorad® automated blood grouping system by column agglutination technique (CAT), strictly following manufacturer’s instructions.

Results: Out of 2000 blood donors, typed for K and k antigens, 1966 were males (98.30%) and 34 were females (1.70%). The frequency of K was 4.05% (81/2000) and that of k was 98.90% (1978/2000). The phenotype K-k+ (95.15%) was most prevalent followed by K+k+ (3.75%), K-k- (0.80%) and K+k- (0.30%).

Conclusion: K antigen frequency is lower than as reported in Caucasions and Saudi Arabia but higher than Indian and African blood donors. This study confirmed that the k (celleno) blood group antigen was highly prevalent antigen in Pakistani population while the K (kelleher) antigen was present in a relatively lower frequency.

Keywords: Blood donors, Kell blood group, K & k antigens.
Amongst Kell antigens, frequency of K ranges between 2-9% among different populations, while k antigen is highly frequent all around the world\textsuperscript{8-10}. Because of lower frequency of K antigen it is easy to find K negative blood for allo immunized patients. On the other hand due to high prevalence of k antigen, probability of anti k alloantibodies is quite low although anti k antibodies have been reported. However, if an individual becomes alloimmunized with k antigen and develop anti-k antibodies, it becomes very difficult to find k negative blood due to high frequency of k antigen\textsuperscript{8}. In pregnant women, transfusion history is strongly contributory to anti-K alloimmunization. About 80% of pregnant women with anti-K antibodies have a history of Red cell transfusion. Some studies suggest the administration of Kell negative blood to women during reproductive age so that alloimmunization could be avoided\textsuperscript{11}.

Present study was planned with an objective to determine the frequency of Kell blood group antigens (K,k) among blood donors from northern Pakistan.

**METHODOLOGY**

This cross-sectional study was carried out at Armed Forces Institute of Transfusion Rawalpindi, Pakistan from 1\textsuperscript{st} November to 31\textsuperscript{st} December 2017 after approval of Ethical Committee of the institute. Data were kept confidential and strictly for academic purpose. Samples of 2000 whole blood donors fulfilling the donor selection criteria were studied. Red blood cells from blood donor samples available after preliminary ABO and Rh D grouping were used for K and k typing. The phenotyping for K and k antigens was performed on fully automated blood grouping Biorad® system using column agglutination technique (CAT). The manufacturer instructions were followed in laboratory procedures for making cell suspensions and quality control. K antigen was detected by direct agglutination whereas indirect antiglobulin technique (IAT) was used for the detection of k antigen as described by manufacturer’s instructions.

**RESULTS**

A total of 2000 samples were analyzed, 1966 were males (98.30%) and 34 were females (1.70%).

<table>
<thead>
<tr>
<th>Antigens</th>
<th>Present Study n=2000</th>
<th>Agha Khan\textsuperscript{13} n=100</th>
<th>India\textsuperscript{9} n=3073</th>
<th>KSA\textsuperscript{8} n=400</th>
<th>Nigeria\textsuperscript{10} n=150</th>
<th>West Africa\textsuperscript{11} n=651</th>
<th>Morocco\textsuperscript{12} n=1286</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>4.05%</td>
<td>-</td>
<td>3.50%</td>
<td>18.2%</td>
<td>2%</td>
<td>0.77%</td>
<td>7%</td>
</tr>
<tr>
<td>k</td>
<td>98.90%</td>
<td>100%</td>
<td>99.97%</td>
<td>97.0%</td>
<td>N/A</td>
<td>99.94%</td>
<td>N/A</td>
</tr>
</tbody>
</table>

The phenotyping showed 81 samples positive for K antigen and 1978 showed presence of k antigen.
antigen. The frequency of K antigen was calculated as 4.05% and of k as 98.90% (fig-1).

Further analysis of results revealed that out of these 2000 samples, 6 exhibited homozygosity (0.30%) for K antigen and 75 showed heterozygosity (3.75%). Majority (95.15%) of these had double dose for k antigen (1903) and 16 were negative for both K and k antigens (0.80%). Thus the phenotype K-k+ (95.15%) came out to be most prevalent followed by K+, k+ (3.75%), K-k- (0.80%) and the least prevalent phenotype was K+, k- (0.30%) as depicted in fig-2.

DISCUSSION

Information regarding prevalence of blood group antigens in a population is useful for transfusion services for provision of safe blood and evidence based management of HDFN. It is also helpful in managing cases of alloimmunization. Multiply transfused patients such as those with thalassaemia, refractoryanemia, multiparous females etc are prone to develop antibodies against blood group antigens other than ABO system. Practically it is difficult to match all these red cell antigens before transfusion to avoid alloimmunization. Finding compatible units for such patients without having any knowledge of prevalence of the implicated antigens in concerned population is difficult which is multiplied further, if the patient has developed more than one antibody.

Our observed K antigen frequency is 4.05 % as against 9% reported in Caucasians. The study by Elsayid M and colleagues in Kingdom of Saudi Arabia showed a higher frequency of K antigen (18.2%) than our study (4.05%) and lower frequency of k (97%) than ours (98.90%)14. Frequency of K antigen in present study (4.05%) is only slightly higher than Indian blood donors (3.5%) as reported by Makroo and colleagues15. Prevalence of k antigen is higher in Indian study (99.97%) than ours (98.90%)14. The K antigen was more prevalent in our study (4.05%) as compared to Nigerian study (2%)6 and in the healthy blood donor population of West Africa (0.77%)16, while the prevalence of k antigen was comparatively less frequent in our study. A Moroccan study on blood donors showed prevalence of K antigens as 7%, higher than ours17 (table). Our study showed that the frequency of phenotype K-k+ is 95.15%, slightly lower than Indian population (96.5%) and K+k+ is 3.75%, slightly higher than Indian study (3.47%)15. A cross sectional study on blood donors at Agha Khan University hospital, Karachi revealed 100% positivity for k antigen and none (0%) of these showed presence of K antigen18. The result showed a significant difference as compared to other studies which are conducted in Asia, including our present study. But this difference could be possibly due to very small sample size.

CONCLUSION

The Kell blood group antigen k (celleno) was highly prevalent in Pakistani population, while the K (kelleher) was less frequent than Caucasians. These results will be helpful in establishing a local donor data bank for transfusion services planning and preparation of indigenous screening and identification cell panels for a nationwide usage. The phenotypic status of Kell blood group antigens should be determined, for phenotypically matched blood transfusions, along with ABO and Rh D typing in patients expected to require multiple transfusions.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

REFERENCES