Bethlehem University Journal, vol. 32, (2013)

The Frequency of K Blood Group Antigen in the Palestinian Population of Hebron District"

Nader Hazboun[1], Elias Amro[2], Hassan Zawahrah[2]

Introduction

The Kell blood group system is an interesting mix of high-frequency and low-frequency antigens. It consists of 25 antigens, which include six pairs or triplets of antithetical antigens. All of these polymorphisms represent SNPs encoding amino acid substitutions on the Kell glycoprotein. The two antithetical antigens (K and k) remain the most common of the system. K has a frequency of about 9% in a Caucasian population, about 3.6% in blacks, and up to 25% in Arabs [(1)]. Despite the low quantity of K antigens on the RBC surface (3500-6000 K copies/cell), it is very immunogenic. It can be detected on fetal RBCs as early as 10 weeks. Outside the ABO and Rh antibodies, anti-K is the most common antibody seen in the blood bank. It is usually made in response to antigen exposure through pregnancy and transfusion and can persist for many years. The antibody is therefore important in transfusion medicine, autoimmune hemolytic anemia (AIHA), and hemolytic disease of the newborn (HDN). People without Kell antigens (K_0) must be transfused with blood donors who are also K_0 to prevent hemolysis.[(2-5)]

Although hemolytic disease of the newborn (HDN) is most common in Rh alloimmunization, about 0.1% of all obstetric patients have maternal antibodies to K antigen. Maternal antibodies are usually due to transfusions of mismatched blood, although immunizations from previous pregnancies can occur. In contrast to HDN caused by antibodies to RhD, there is a poor correlation between maternal anti-K titre and the severity of the disease. It has been suggested that fetal anemia, due to Kell antibodies is due mostly to suppression of erythropoiesis rather than to hemolysis[(2)]. The frequency of K antigen has been determined in Caucasian and African populations. The purpose of this study is to determine the frequency of K-positive and K-negative blood in the Palestinian population of Hebron District. No statistical data about Kell antigens are available in Palestine during my search for such data. We have recently determined the K antigen frequency in Bethlehem District in 2009/2010 [(6)] and this study is a continuation of the previous one. Knowing the most frequent Kell phenotype will give us an estimate of the probability of producing anti-K antibodies incases of blood transfusion. If anti-K develops, compatible units should be transfused. Therefore, if the incidence of K antigen in Hebron District is low, the chance of receiving a K+ unit is small, and the probability of producing anti-K is low.

[1]Mr.Nader Hazboun, MSc, Biology Department, Bethlehem University, Bethlehem, Palestine.

[2]Mr. Elias Amro, BSc, Graduate of the Biology Department, Bethlehem University,Bethlehem,Palestine.

[2]Mr. Hassan Zawahrah, BSc, Graduate of the Biology Department, Bethlehem University,Bethlehem,Palestine.

Materials and Methods

A total of 1321 samples were collected in EDTA tubes from different hospital laboratories in Hebron District. The monoclonal anti-K antibodies were obtained from Lorne Lab Limited, Berkshire, England.

One drop of 3-5% RBC suspension was mixed with one drop of monoclonal anti-K in 12 x 75 mm test tubes. The tubes were then centrifuged for 1 minute at 2000 rpm. After resuspension by agitation, the tubes were examined for agglutination. All negative tubes were incubated at RT for 15 minutes, centrifuged and looked for agglutination. The same procedure was applied on the positive and negative controls.

Results & Discussion

A total of 1321 EDTA blood samples have been typed for K antigen and the following results in table 1 below were obtained:

Table 1: Frequency of K-negative and positive blood in Hebron District

K-antigen typing	Number of Patients	Frequency of K-negative and K-positive blood
K-negative blood	1229	93%
K-positive blood	92	7%

*The positive control shows 4+ agglutination grade.

**The negative control shows a smooth suspension.

The above results demonstrate that till now the frequency of K+ and K– blood phenotypes in the Palestinian population of Hebron District is between that of Caucasians and Afro-Americans as shown in table 2 below:

Table 2: Comparison of K antigen frequency in different populations

Legend	Afro-Americans	Hebron District	Caucasians
Frequency of K+ phenotype	**3.5%**[3]	**7%**	**9%**[3]
Frequency of K– phenotype	**96.5%**[3]	**93%**	**91%**[3]

The incidence of K+ antigen in Hebron district is higher than that in Bethlehem District (7.0% vs 5.6%[6] respectively) but is still low compared to that with Caucasians, and so the chance of receiving a K+ unit and becoming immunized for the antigen is small.

One of the practical applications of our study is to calculate how many units would need to be tested to find for example 4 units of K-negative blood for an individual in Hebron District with anti-K? We know from our results that 0.070 of the random population are K+ or that 0.930 are K-negative. The number of random units needed for antigen screening is calculated by dividing the number of K-negative units by the

incidence of K-negative individuals in the donor population. Therefore, in this case, testing between 4 and 5 random units should yield 4 units of K-negative blood.[3]

Recommendations & Applications:

1) Despite its low incidence in both Hebron and Bethlehem Districts we still encourage start typing for K antigen before blood transfusion to patients since it's the third immunogenic blood group system after ABO and Rh. So it's able to sensitize patients and induce a delayed hemolytic transfusion reaction.

2) We hope that we'd be able to determine the most common Kell phenotypes in all parts of the West Bank so that the results would applicable to all Palestinians.

3) We also need to screen the blood of pregnant women in our country for anti-K antibodies that are responsible for developing hemolytic disease of the newborn in K-positive fetuses.

Acknowledgements:

1) We thank BU for its internal research grant (IRG).

2) We'd like to thank both Hebron Governmental and Al-Ahli hospitals for providing us with the EDTA blood samples.

3) A special word of thanks is due to my senior students Mr. Elias Amro and Mr. Hassan Zawahrah who were actively involved in this study.

References

1) Laura Dean (2005). Blood Groups and Red Cell Antigens. National Center for Biotechnology Information (NCBI), National Library of Medicine, NIH, Ch.8. Website: http://www.ncbi.nlm.nih.gov/books/NBK2270/. Retrieval Date: 25-1-2013.

2) Colvin Redman, David Russo, Soohee Lee (1999). Kell, Kx and the Mcleod syndrome. Best practice and research Clinical Hematology 12: 621-635.

3) Denise Harmening (2005). Modern Blood Banking and Transfusion Practices. F.A. Davis, 5th edition; 175-180.

4) Geof Daniels (2005). The molecular genetics of blood group polymorphism. Transplant Immunology 14: 143-153.

5) Sohee Lee, David Russo, Colvin Redman (2000). The Kell blood group system: Kell and XK membrane proteins. Seminars in Hematology 37: 113-12.

6) Hazboun Nader (2010). The frequency of the most common Kell phenotypes in the Palestinian Population of Bethlehem District; Short Communication, Bethlehem University Journal Vol. 29: 41-45.