Journal of
Blood Disorders & Transfusion

Elmissbah et al., J Blood Disorders Transf 2013, 4:3
DOI: 10.4172/2155-9864.1000140

Research Article Open Access

Distribution of Kell Blood Group System Antigens Kp^a, Kp^b, and Phenotypes in Major Populations of Sudan

Tariq Elmissbah*

Department of Medical Sciences and Clinical Technology College of Applied Medical Sciences- Taif University, Saudi Arabia

Abstract

Objective of the study: To determine the frequency of kell blood group antigens Kp^a, Kp^b and their phenotypes in major Sudanese population.

Background: Kell blood group system was discovered by Coomb's, Mourant, and Race in 1946 from child of Mrs. Kell who was suffering from HDN, and the antibody coated red blood cell of the newborn gave positive direct coomb's test, the reason was unexplained and search for antigen lead to discovery of new antigen, named „Kell".

Study design: This study was carried out on 1000 samples in ten major Sudanese tribes. Each sample was tested for Kp^a , and Kp^b using immunodiffusion gel system.

Materials and methods: This study was carried out in the period between July and December 2009. One thousand venous blood samples were collected into EDTA containers from unrelated individuals after taking consent from the health authority. The Kell Blood group antigens were detected using of gel immune-diffusion system

Results: The results showed that the frequency of Kp^a in the major populations of Sudan was 2%, when the frequency of Kp^b was the highest with frequency of 99.4%.

Conclusion: The frequency of Kell blood group antigens Kp^a and Kp^b in the major populations of Sudan found to be similar to international frequencies.

Keywords: Kp^a; Kp^b; Major Sudanese population; Immunodiffusion gel technique

Introduction

Human red blood cells contain on their surface a series of glycoproteins and glycolipids which constitute the blood group antigens .The development of these antigens is genetically controlled; they appear early in fetal life and remain unchanged until death [1].

The discoveries of the various blood group systems and the conclusion drawn from the research into families have laboratory tests in cases of disputed paternity and maternity, cases of supposedly misidentified babies in hospitals and nurseries, kidnapping cases, and suit of kingship in immigration and citizenship claims, as well as an opening of new fields in anthropology and personal identification [2].

Now approximately more than 7oo red blood cell antigens have been described (www.american association of blood bank.com). The clinical significant of blood groups in blood transfusion is that individual who lack a particular blood antigen may produce antibodies reacting with that antigen which may cause blood transfusion reaction.

At least fifteenth well-defined red cell blood group systems of wide distribution in most racial groups have been described these are the ABO, Rh, MNSs, Kell, Duffy, Kidd, Lewis, Lutheran P, Diego, Yt, xg, Ii, Dom Brock, and Colton systems. Only two of these systems have an major importance in clinical practice these are ABO, and Rh, and six blood groups have minor clinical importance that are Kell, Duffy, Kidd, Lutheran, P, MN, Ii [3].

Kell blood group system was discovered by Coomb's, Mourant, and Race in 1946 from a child of Mrs. Kell who was suffering from HDN, and the antibody coated red blood cell of the newborn gave positive direct coomb's test, the reason was unexplained and search for antigen lead to discovery of new antigen, named "Kell". The propositus had an antibody which reacted with all cells except that of her sisters; both sisters were found to be K-k .The antibody was designated anti Ku. Kp^a, a new antigen in kell blood group system was reported by Allen and Lewis in 1957. Later, the same workers described an anti-Kp [4].

The antigens of Kell blood group system were named after the individuals in whom the antibodies were first found. In 1961, Allen and Rosenfield proposed a numerical nomenclature. The antigens of Kell blood group system are about 22 antigens. The Kp^a, and Kp^c alleles are low –frequency mutations compared to their high –frequency partner Kp^b [4].

The antigen Kp^a (K3) occurs approximately in 2.0 per cent of random North Americans white blood. (The gene sometimes suppresses the expression of K, K11, K14, and K18 when it is *cis* or *trans* to any kell autosomal gene [4].)

The antigen kp^a has not been reported in blacks. The antithetical antigen Kp^b (K4) is extremely common; only two Kp (b-) samples were found by Allen and associates in 1958 in tests on 5500 whites. The antigen Kp^c was described by Yamagushi and coworkers in 1979, who described several siblings from consanguineous marriage who typed as Kp (a-b-) but otherwise had normal kell antigens. They concluded that

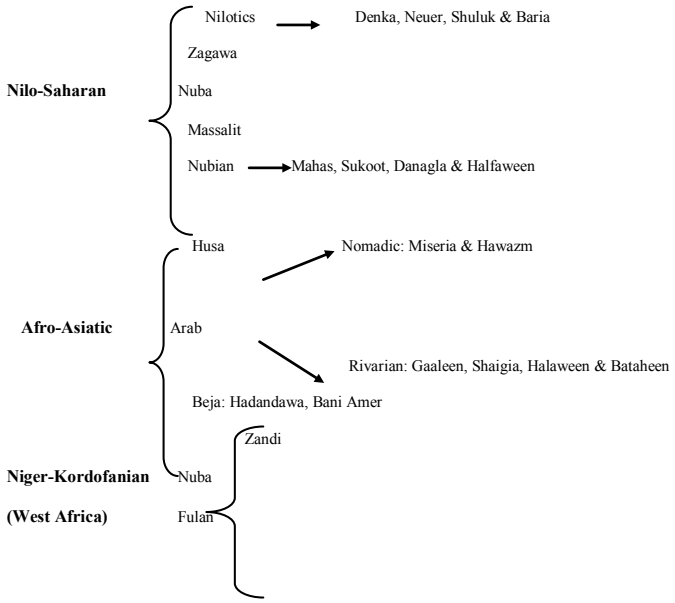
***Corresponding author:** Tariq Elmissbah, Department of Medical Sciences and Clinical Technology College of Applied Medical Sciences, Taif University, Saudi Arabia, E-mail: jamshoro@yahoo.com

Received December 11, 2012; **Accepted** June 04, 2013; **Published** June 08, 2013

Citation: Elmissbah T (2013) Distribution of Kell Blood Group System Antigens Kp^a, Kp^b, and Phenotypes in Major Populations of Sudan. J Blood Disorders Transf 4:140. doi:10.4172/2155-9864.1000140

both parents carried an allele that they named Kp^c assuming that the children had inherited this gene from both parents [5].

Sudanese Population Linguistics Groups:



Materials and Methods

One thousands samples were collected form Sudanese unrelated individuals from both genders belonging to the major Sudanese ethnic populations. One hundred samples were collected from the following tribes, Danagla, Denka, Halaween, Hadandawa, Jalieen, Misseria, Mahas ,Nuba, Shaigeia, and Zaghawa. Sample size was calculated using the approximate proportion to population size in Sudan. The study was done in over six months. Each participant, who accepted to participate in the study, received three sheets, (consent form, finger puncture form and questionnaire).

Immunodiffusion gel system (ID-Gel System) reagents

- ID-Cards"Anti-K" with 6 microtubes containing anti-K of human origin within the gel matrix.
  Preservatives < 0.1%NaN_3
- ID-Cards"Anti-k" with 6 microtubes containing anti-k of human origin within the gel matrix.
  Preservatives < 0.1%NaN3
- ID-Cards"Anti-Kp^a" with 6 microtubes containing anti-Kp^a of human origin within the gel matrix. Preservatives < 0.1%NaN_3
- ID-Cards"Anti-Kp^b" with 6 microtubes containing anti-Kp^b of human origin within the gel matrix .Preservatives < 0.1%NaN_3
- ID. Test sera, of human origin, freeze-dried, in 0.5 vials.
- ID-Cards"LISS"/Coombs"with 6 microtubes containing polyspesefic anti-human globulin, within the gel matrix.

Procedure

5% of red blood cell suspension was prepared by dispensed of 0.5 ml of ID-Diluent 1 into clean test tube.

50 µL of whole blood or 25 µL of packed red cells was added to the same test tube, and mixed gently. Test tube was incubated for 10 minutes at room temperature (18-25°C). The micro tubes of the ID-Cards were identified with the donor's name and/or number, and the aluminum foils were removed from as many microtubes as needed. 10 µL or 12 µL of the red cell suspension was added to the appropriated microtubes (one for K1, and other for K2. ID-Cards were centrifuged for 10 minutes in the ID Centrifuge.

Results

The distribution of Kell blood group antigens and Kp^b in major Sudanese populations are shown in Table 1. Overall Kp^a antigen was the commonest kell antigen (99.8%), followed by Kp^b antigen (2.3%). The frequency of Kp^b antigen was 100% in tribes of Danagla, Denka, Jalieen, Mahas, Nuba, and Zaghawa, but in tribes of Misseria, and Shaigeia was 99%. The frequency of Kp^b antigen in Danagla, Denka, Halaween, Hadandawa, Jalieen, Misseria, Mahas, Nuba, Shaigeia, and Zaghawa were 4%, 2%, 1%, 1%, 3%, 1%,1%, 1%, 1%, 1% respectively (Table 1). Distribution of Kell blood group phenotypes **Kp (a+b+), Kp (a-b+), Kp (a+b-)** were shown in Table 2.

Discussion

Distribution of Kell blood group system antigens Kp^a, and Kp^b in Sudanese population are not far away from other populations throughout the world. Kell blood group antigen Kp^a was most frequent in Sudanese population (99.8%), in compared with American population the frequencies of Kp^a (4%), and Kp^b (100%) antigens were in agreement with their frequencies in white and black American [6]. The frequency of Js^b antigen was close to white American (99%), but higher than black American (80%) (Neville, 1994). Kp (a-b+) phenotype was detected in high frequency (93%) which was near to white (98%), and black Americans (99%) [7]. Frequency of Kp (a+b-), was encountered

Tribe	Kp^a(K3)	Kp^b(K4)
Danagla	4	100
Denka	2	100
Halaween	1	99
Hadandawa	1	99
Jaalein	3	100
Misseria	1	99
Mahas	1	100
Nuba	1	100
Shaigeia	1	100
Zaghawa	1	100
Total	16	997
%	1.6	99.7

Tables 1: Frequency of Kell Blood Group Antigens among Sudanese Tribes.

Tribe	Kp (a+b+)	Kp (a-b+)	Kp (a+b-)	Kell null
Danagla	4	96	0	0
Denka	2	98	0	0
Halaween	0	99	1	0
Hadandawa	0	99	1	0
Jaalein	3	97	0	0
Misseria	0	99	1	0
Mahas	1	99	0	0
Nuba	2	98	0	0
Shaigeia	1	99	0	0
Zaghawa	1	99	0	0
Total	14	983	3	0
%	1.4	98.3	0.3	0

Tables 2: Frequency of Kell Blood Group Phenotypes among Sudanese Tribes.

in low frequencyof (0.3**).** This study proved that there is no significant differences between the frequencies of Kell blood group antigens, Kpa and Kp^b and their phenotypes in diffrenet Sudanese populations which may be explained due living in the same geographical area that increases like hood of the interaction between them. Any similarity between Sudanese populations and other populations throughout world purely is a matter of chance.

References

1. Daniels G, Hadley A, Green CA (2003) Causes of fetal anemia in hemolytic disease due to anti-K. Transfusion 43: 115-116.
2. Reid ME, Lomas-Francis C (2004) The Blood Group Antigen Facts Book. (2ndedn). 2004, New York: Elsevier Academic Press.
3. Shakila A, Moinuddin (2001) Kell blood group, a population based study. PK J Med Sci. 17: 211-214.
4. Neville JB (1994) An introduction to immunohematology. 3rd edition, Toronto: Congress L.
5. Ahaded A, Brossard Y, Debbia M, Lambin P (2000) Quantitative determination of anti-K (KEL1) IgG and IgG subclasses in the serum of severely alloimmunized pregnant women by ELISA. Transfusion 40: 1239-1245.
6. Daniels G, Hadley A, Green CA (2003) Causes of fetal anemia in hemolytic disease due to anti-K. Transfusion 43: 115-116.
7. Hoffbrand AV, Pettit AE (2001) Post graduate hematology. (4thedn), British library, London.

Citation: Elmissbah T (2013) Distribution of Kell Blood Group System Antigens Kp^a, Kp^b, and Phenotypes in Major Populations of Sudan. J Blood Disorders Transf 4:140. doi:10.4172/2155-9864.1000140