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Mapping of Blood Group and Phenotypes Rhesus and Kell to Sickle Cell Desease Patients in Transfusion Program at the National Blood Transfusion Center (NBTC) of Abidjan Côte d'ivoire

Sekongo Yassongui Mamadou[1, 2, *], Kouamenan Goore Sidonie[1], Kassogue Kadidia[1], Konan Sidoine[1], Kouassi Parfait[1], Lagou Amélie Delphine[3], Kouacou-Ama Patricia[4], Konate Seidou[1], Abisse Agba[1]

[1]Therapeutic and Research Unit, National Blood Transfusion Center, Abidjan, Côte d'Ivoire
[2]Hematology clinic, University Hospital of Yopougon, Abidjan, Côte d'Ivoire
[3]Nephrology service, University Hospital of Yopougon, Abidjan, Côte d'Ivoire
[4]Immunology service, University Hospital of Cocody, Abidjan, Côte d'Ivoire

Email address:
Sekyass@yahoo.fr (S. Y. Mamadou)

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Abstract: The objective of this study is to establish the mapping of blood group and phenotype Rhesus and Kell and compare it to the population of blood donors. Methodology: It is a prospective study performed in transfusion therapy unit (UTT) of the national blood transfusion center (NBTC) of Abidjan on sickle cell desease patients multitransfused between February and October 2013. The blood group ABO and phenotype Rhesus and Kell of the patients was performed by the gel agglutination technique. The statistical analysis was performed using SPSS 15.0 software. Results: Among the 145 patients followed by the UTT, males predominated with (sex ratio 1.27). The median age was 14 years. Homozygous sickle cell disease (SS) was more frequent (57.25%). The blood group O was more represented (54.6%). Ag D was found in 96%. The Ag C (16.5%) and Ag E (14.5%) have lower frequencies than those founded in the population of blood donors (Ag C 21.6% and Ag E 22.2%). The most phenotype rhesus and kell frequently encountered to the patients was C- c+ E- e+ K- (49.7%). These frequencies are lower than those of the blood donors population. Conclusion: Blood group O is the most common to our patients. The Ag D is the most found. The phenotype Rhesus and kell C- c + D + E- e- K- predominates with but remains below the frequencies reported among blood donors. This proves that there are risks of alloimmunization to these patients; hence the necessity to transfuse according to the protocol phenotyped and compatibility.

Keywords: Mapping, Blood Group and Phenotyps Rhesus and Kell, Sickle Cell Desease Patients, Transfusion Program

1. Introduction

A blood group is a classification based on the presence or absence of inherited antigenic substances on the surface of red blood cells (rbcs). These antigens may be proteins, carbohydrates, glycoproteins or glycolipids, according to the blood group system, and some of these antigens are also present on the surface of other types of cells of different tissues.

The different blood types are grouped into systems. Belongs to the same system of blood groups all epitopes or phenotypes resulting from the action of different alleles of the same gene or closely related genes.

Blood is a liquid tissue that can easily be taken from a healthy individual to transfuse a patient individual. However, despite an identical cellular composition of this fabric, there is variability, or polymorphism of the various components of the blood between individuals, this making impossible

transfusion between some groups of people. People who have the same characteristic belong to the same blood group. Generally, these features are highlighted by hemagglutination techniques using antibodies or lectins that specifically recognize an epitope. If problems occur, it can be appealed to the molecular biology. These epitopes, determining various phenotypes, are genetically transmitted.

In France, as in many developed countries, blood transfusion is preceded by an immunological assessment including blood group phenotype rhesus kell at least. Mapping of these groups is clearly established there [1, 2]. In Africa at the south of Sahara, especially in Côte d'Ivoire, mapping of the RHK phenotypes is not clearly established. However, some estimates made by some studies of the NBTC [3] shows a predominance of the phenotype C- c+ D + E- e+ K- among regular blood donors. But this estimate is not done on all blood products distributed by the NBTC.

Subjects at risk of transfusion accident being multitransfused as sickle cell desease patients, who unfortunately are not always properly phenotypes, it was important that we conduct this study to the patients in transfusion program to the transfusion therapy unit of NBTC in Côte d'Ivoire.

The objective is to establish the mapping of blood group and the phenotypes Rhesus ans kell.

The specific objectives are :

1) To study the distribution of ABO Rh (D, C, E, c, e) and Kell (K, k) antigens

2) Make a comparison with blood donor population.

2. Patients and Methods

This was a prospective and descriptive study followed in the transfusion therapy unit (UTT) at the national blood transfusion center (NBTC) of Abidjan Côte d'Ivoire between February and October 2013. It involved major sickle cell desease patients, of all ages and both sex, admitted to the transfusion therapy unit for which a long-term transfusion program was put in front of the major complications of sickle cell disease.

We proceeded by simple random sampling of sickle cell patients multitransfused consenting and tracked to the UTT

Were included in our study, patients having made their blood group and erythrocyte phenotype Rhesus and Kell at the NBTC laboratory during our study period.

Were not included in this study, sickle cell patients multitransfused not having cooperated, which have not been followed in the UTT and those not having blood type phenotype rhesus and kell.

A survey form was used to obtain information on applications for pre-transfusion testing (phenotypes RH and Kell, and the laboratory Direct Compatibilty Test (EDCL) and their results. The objectives of the study were explained to the patients and / or their parents to obtain their consent.

The blood sample were done on purple tube (EDTA) for blood groupe and the phenotype RH kell.

The patients erythrocyte phenotyping ABO-RH and Kell were performed by the technique of gel agglutination diamed® according to manufacturer's recommendations.

The collected data were entered using the EPI-DATA 3.0. Statistical analysis was performed using SPSS 15.0 software.

3. Results

We noted a male predominance with a ratio M / F 1.27

The age group of 11-15 years predominated slightly (33.1%) on an essentially young patient population with extremes of 3 years and 62 years and a median of 14 years

Just over half of the patients (57.24%) were homozygous (SS phenotypes). (table I)

Table I. *Epidemiological parameters.*

Age group		Number (n=145)	Percentage(100%)
	0 - 5	18	12,4
	6 - 10	37	25,5
	11 - 15	48	33,1
	16 - 30	23	15,9
	>30	19	13,1
Sex			
	Male	81	55,9
	Femal	74	44,1
	Sex-ratio	1,27	
Hemoglobin phenotype			
	SS	83	57,2
	SFA2	37	25,5
	SAFA2	3	2,1
	SC	22	15,2

Severe vascular oclusive crisis was the main indication with 32.7%. Legs ulcers represented 12,4%. (table II).

Table II. *Indication of blood transfusion.*

Indication	Number	Percentage
Leg ulcers	18	12,4
Severe vascular-oclusives crisis persistent	45	31
Acute chest syndrome	11	7,6
Repetition acute hemolytic crisis	15	10,3
Cerebrovascular accident	13	9
Cerebral vasculopathy	7	4,8
Pregnancy	16	11
Priapism	3	2,1
Cardiomyopathy	10	7
Spleenectomy	7	4,8
Total	145	100,0

Half of our patients had a hemoglobin levels between 7

and 9 g/dl (figure 1)

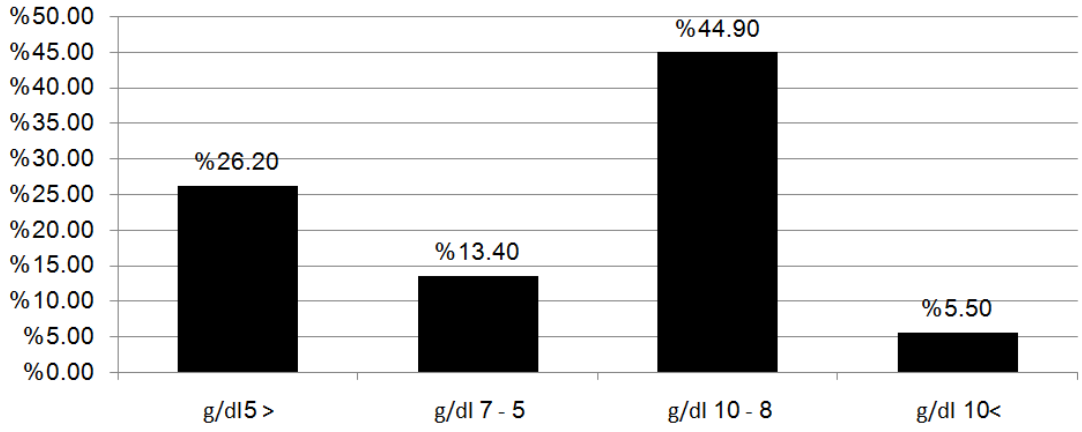

Figure 1. *Hemoglobin level at the first consultation.*

Patients with blood group O were most represented with 54.5%. (figure 2)

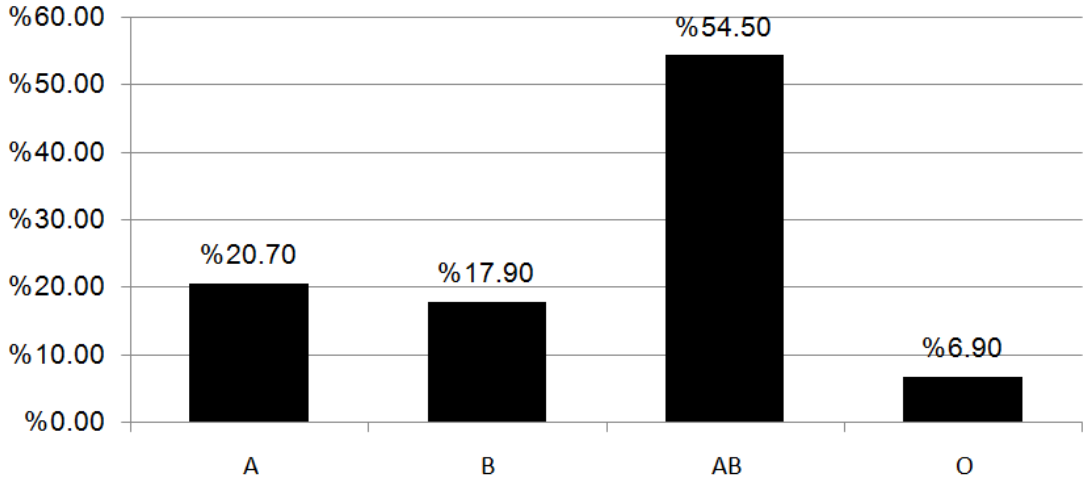

Figure 2. *Blood groups ABO.*

The Ag D represented 95.9% of the study population. (figure 3)
The Ag c, e represented 82% and the Ag k 97,9% in our study. (figure 3)

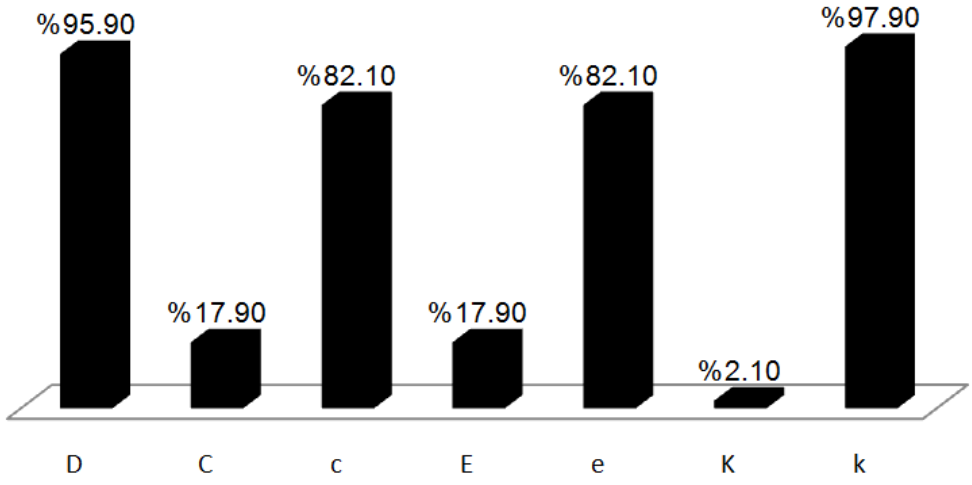

Figure 3. *Rhesus and Kell antigen system.*

The following erythrocyte phenotype RHK C- c+ D + E- e + K- was majority with 49.6%. (table III)

Table III. *Rhesus and Kell phenotyps.*

Erythrocyte phenotyp RHK	Number	Percentage
C- c+ D+ E- e+ K-	72	49,6
C- c+ D+ E+ e+ K-	26	17,9
C- c+ D+ E+ e- K-	2	1,4
C+ c+ D+ E- e+ K-	25	17,2
C+ c- D+ E- e+ K+	1	0,7
C+ c+ D+ E+ e+ K-	4	2,8
C- c+ D- E- e+ K-	11	7,6
C+ c+ D- E- e+ K-	4	2,8
C+ c- D+ E- e+ K-	0	0
Total	145	100,0

4. Discussion

Among the 145 patients followed in the Transfusion Therapy Unit (UTT), we noted a male predominance with a sex ratio of 1.27. This result is comparable to that obtained by the team of the Clinical Department of the University Hospital of Yopougon and the national blood transfusion center in Abidjan in 2010 which found that 56.3% of patients followed were male [4; 5].

The age group 10- 14 years were most represented with 33.1%. This predominance is due to a high frequency of painful crises and major complications. Furthermore, in a study conducted in the Librevillois (Gabon) pediatric setting on the management of sickle cell pain, ELOUNDOU found that children aged 10 to 14 years are more painful attacks and complications. [6]

Homozygous sickle cell disease (SS) predominated with 57.25%. It was followed by the heterozygous form SFA2 25.51%. This would be due to the severity of the disease in this form with the onset of vaso-occlusive crises and anemic syndromes. Our results are close to those obtained by Sangare A. And colleagues [4] and Tolo A and colleagues [5] with a predominance of SS and SFA2 forms. Similarly in Mali, Diallo had found 54.6% of SS form, 33.3% of SFA2 form. [7]

The persistent severe vascular-occlusives crisis to sickle cell anemia patient was the main indication with 32.7%. A descriptive study in four Parisians centers to 299 patients followed from 1987 to 1997 confirmed this result with 58% of cause of hospitalization. [9]

The hemoglobin level was between 7-9 g / dl to 44,9% of patients. These results were confirmed by Tolo A. Et colleagues in a study intitle « homozygous sickle cell disease to Ivorian adult over 21 years » with hemoglobin levels between 6-10 g / dl to 58.3% of patients. [5]

The blood group O was more represented (54.6%), reflecting the blood group in the general population [9 ; 10]. C Dulat and colleagues [11], in their study « the ethnic distribution of blood groups in Côte d'Ivoire » have found the following frequencies: A = 23.5%, B = 23.5%, AB = 4.5%, O = 48.5%.

The various reports activities of the National Blood Transfusion Center [12 ; 13 ; 14] reported a predominance of blood group O in 49% to blood donors in Côte d'Ivoire.

The Ag D was found in approximately 96% of our patients. This result corroborates the data from the Ivorian literature [3; 10,12] which noted that 95% of the Ivorian population has Ag D.

The Ag C (17.9%) and Ag E (17.9%) have lower frequencies than those found in the population of blood donors in the study of Dembélé and colleagues (3) who reported respectively, 6% for Ag C and 22.2% for Ag E to the blood donors. This difference would induce a high risk of alloimmunization in multiple transfusions.

The Ag k (97,9%) is the most founded to our patients. All the studies confirmed the predominance of the Ag k to black africans [3 ; 10].

The most phenotype Rhesus and Kell frequently encountered to the patients in the study was C- c+D+ E- e + K- with 49.6%. These frequencies are close to those obtained by Corrain and Capitanio [15] in the Ivorian population (from 55.8 to 70%). Dembele B. And colleagues [3], in their study « compatibility study between erythrocyte Rh Kell blood to donors and patients in Abidjan » found a predominance of the phenotype C- c + D+ E- e + K- to 70.5% of patients and to 62% of blood donors. Siransy Bogui and colleagues.[10] reported the prevalence of C- c + D+ E- e + K- to 65,12%. The prevalence of this phenotype was also reported in different Black populations [16] corroborating his Negroid character.

This profile is different from that observed in the whites where the phenotype D+C+ c+ D+ E- e+ is the most popular [17 ; 18 ; 19]

However, our frequencies being lower than that of the population of phenotyped blood donors, this means that there is a major risk of incompatible transfusion to sickle cell patients multitransfused if they are not properly phenotyped.

This difference between our results and those reported by other series would be due to the heterogeneity of our population of patients with sickle cell disease which coming from several African countries.

All these data suggest the possibility of post-transfusion alloimmunisation involving RHK antigens. Akre DP colleagues[20] reported alloimmunisation to 62,8% of sickle cell patients transfused with non-compatible Rhesus Kell phenotype blood.

The blood alloimmunisation depends partly on antigenic differences between donor and receveur[21 ; 22 ; 23 ; 24].

5. Conclusion

Sickle cell disease is a hereditary disease whose treatment is symptomatic. The transfusion therapy unit of the national blood transfusion center of Abidjan is an efficient support

service for complications and regular monitoring of the long-term transfusion program for improvement of the patients living conditions. In this study, we found that blood type O was the most frequent to these patients. The D antigen was the most found. However, Antigen C and E were found low compared to blood donors data.

The erythrocyte phenotype Rhesus and kell C+c- D + E+e- K- predominated with 49.7% but this frequency remained lower compared to that reported in the general population and among blood donors. This proves that there are risks of alloimmunization to major sickle cell desease patients transfused; hence the necessity of the phenotype patients and especially to transfuse them according to the phenotype and compatibilized protocol. But it also requires that all blood products are also phenotyped.

However, the extension of these analyses is full mastery of their costs, and training of stakeholders involved in the transfusion process.

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