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Erythrocyte alloimmunization, rhesus and kell phenotypes for women of childbearing age in Yaounde

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Abstract

Erythrocyte alloimmunization has adverse consequences for polytransfused and obstetric for the fetus of an allo immune mother. However, it remains undervalued in our country. To give an estimate, from September to December 2016, we conducted a prospective study that included 157 women, including 54 transfused and 103 women who previously had a history of non-transfusion obstetrics. These patients were recruited from the maternity ward at Central Hospital in Yaounde. Irregular agglutinins (IA) were investigated at the Freelys Nano and tube stations using the indirect Coombs technique, blood grouping in the ABO system, and rhesus and Kell phenotypes were made on a plate by the agglutination technique at the Bethany laboratory. Regarding the incidence of irregular agglutinins in non-transfused women with an obstetrical history, 21% (22/103) were positive at RAI. Similarly, 33% (18/54) of the polytransfused multiparas were alloimmune. Similarly, 33% (18/54) of the polytransfused multipares were immunized. The most frequent antigenic combinations in the study population were D+C-E-c+e+ (60%), D+C+E-c+e+ (24%). D+C+ E-c+e+(0.61%), D+C-E+c+ (0.61%), D+C+E+c+e+ (1.8%) were rare. The most found antigens were: c (99%), e (99%), D (97%) and d (2%), K+ (1%) were rare. To reduce the risk of allo immunization in Cameroon phenotype at least in rhesus and Kell systems, the search for irregular agglutinins must be done routinely in transfusion therapy and in obstetrics. Transfusion of non-phenotyped blood should be formally prohibited in the general population; especially among women of reproductive age.

Keywords: Allo immunization, Rhesus and Kell phenotypes, Irregular agglutinins, Blood transfusion, Sickle cell disease.

INTRODUCTION

Allo immunization is the formation of antibodies in an individual from antigens from a living being of the same species. It can result from blood transfusion, tissue transplants, organs or incompatible pregnancies [1]. One of the effects of allo antibodies on red blood cells is hemolysis. In blood transfusion this hemolysis can lead to transfusion inefficiency or stalemate, which may have implications for the lives of patients whose survival is conditioned by transfusions [2]. In alloimmune women, alloantibodies can cross the placenta and attack fetal red cells. The result can be hemolytic anemia and even in some cases fetal death in utero [3]. In view of the consequences of all immunization, some countries, such as France, have made formal arrangements for blood transfusion aimed at preventing or reducing the formation of alloantibodies, particularly in women of childbearing. These measures consist, among other things, of phenotyped blood transfusions and the systematic search for irregular agglutinins (IA) [4]. Indeed the frequency of anti-erythrocyte allo immunization is variable from one country to another in the world, with a predominance of antibodies of the Rhesus and Kell system. Bajpai et al., in a study conducted in New Delhi, India, found a frequency of 5.22% of alloantibodies in polytransfused patients, including 3.17% of women. 61.36% of these alloantibodies belonged to the Rhesus system [5]. In Cameroon, data are scarce, the search for irregular agglutinins and rhesus phenotypes other than D and Kell are not systematic in obstetrics and in the transfusion process. Thus, the frequency or prevalence of anti-erythrocyte allo immunization in obstetrical women is not well known. This is the reason that led us to conduct this study in order to assess the frequency of allo-immunocyte immunization in women of childbearing age who are transfused or not.

METHODOLOGY

We recruited our patients at the maternity ward of Yaoundé Central Hospital from September 2016 to December 2016. The analyzes were done in the Bethany laboratory. An information leaflet, informed consent and a questionnaire were sent to each participant. The collected information provided information on socio-demographic data, transfusion and obstetric history, blood group, Rhesus and Kell phenotypes, and history of irregular agglutinins (IA). We used a range of red blood cells "Hemascreen" laboratory Diagast, containing the majority of antigens (D, C, E, c, e, Kell, Duffy, KIDD, MNS, LEWIS, LUTHERAN ...) responsible for allo immunization. The quality control was carried out by the "sera" reagents of the Diagast laboratory. The IA was systematically performed on the plasma sample of all the participants included in the research by the indirect Coombs technique on magnetized microplate in the Freelys nano station. The rhesus and Kell phenotypes of the participants were determined from the MEDIFF laboratory anti-sera D, C, E, c, e, K by the plate agglutination technique.

The analysis of the data was done using the Excel 2013 software. The proportions or frequencies were obtained by the Excel calculation tables.

RESULTS

In our study were included 157 women all with at least one obstetrical history. Of these, 34% (54/157) had a history of transfusion, 72 (46%) had no history of transfusion but received a blood infusion during our study; 20% (31/157) had not been transfused before or during our study. Age ranged from 18 to 48 years (Table 1). Irregular agglutinins were found to be positive in 33% (18/54) of women of childbearing age who were polytransfused, and in 21% (22/103) of women with prior obstetrical history (Table 2). The number of allo immunizations varies according to the number of pregnancies (Table 3). In the rhesus system, the phenotype Dccee, DCCee, DccEe, kk were predominant in transfused women. The phenotypes DCcEe, DCCee, DccEE, KK, were rare (Table 4).

Table 1: Distribution of women by age group

Age group	Effective	Fréquency(%)
15-20	12	7,6
21-25	30	19,1
26-30	48	30,57
31-35	30	19,1
36-40	15	9,55
41-45	10	6,36
46-50	12	7,6
Total	157	100

Table 2: Distribution of irregular agglutinins (IA) in the study population

Population	total Effective	Positive IA	Négative IA	IA Positive Frequency (%)	IA Négative Fréquency (%)
Women of childbearing age transfused polytransfused	54	18	36	**33,3**	66,6
Women of childbearing age without a history of transfusion	103	22	81	**21,6**	79,4

Table 3: Frequency of allo immunization according to the number of pregnancies

Number of pregnancies	Effective	positive IA	Positive Frequency IA (%)
1 à 2	60	9	15
≥ 3	40	13	**30,5**
Total	103	22	21,3

Allo immunization is more common in women with at least three pregnancies.

Table 4: Distribution of the Rhesus and Kell phenotype in the study population

Phenotypes Rhesus and Kell	Women transfused	Frequency among women %	Total Study population	Frequencies in Study population (%)
D+C-E-c+e+	42	51,29	165	50,45
D+C+E-c+e+	23	28,0	81	24 ,8
D+C-E+c+e+	13	16	63	19,3
D+C+E+c+e+	2	2,5	6	1,8
D+C+E-c-e+	1	1,2	2	0,61
D+C-E+c+e-	1	1,2	2	0,61
D-C-E-c+e+	0	0	8	2,44
Total	82	100	327	100
K+	2	2,24	5	1,52
K-	80	97,5	322	98,5
Total	82	100	327	100

DISCUSSION

The frequency of allo immunization in women who are polytransfused in our study was 33.3%, which leads us to believe that allo immunization concerns any person who is polytransfused. The frequency found in non-transfused multiparas was 21.6%, suggesting that blood transfusions increase allo immunization in women of childbearing age. Variable but significant frequencies of alloimmunization were found in various studies on both sides of the world. In Cameroon, out of 110 polytransfused hemodialysis patients at the Yaoundé General Hospital, 46.36% were alloimmune [6]. One of the challenges of transfusion safety seems to be the reduction or eradication of post-transfusion allo immunization, the consequences of which are well established. We have found that the rate of allo immunization was significant in multiparas without transfusion antecedents (21.36%). This frequency was higher than that found in obstetric environment in Tunisia 5,17% [6] and in that obtained in 77 multiparas in Oxaca in Mexico 2,6% [7]. In France, Poissonnier and his colleagues showed a frequency of maternal foeto incompatibility (MFI) of the order of 0.01% for the Rh1 Rhesus and less than 0.05% for the other antigens of the Rhesus system [8]. These low frequencies in these countries was due to the facts of the measures taken for the surveillance, the control, the screening, the prevention, the rigor in the immunoprophylaxis, particularly rigorous in the women in obstetric environment. Indeed, in this population, search of irregular agglutinins is systematic at different periods of gestation, and after childbirth. Screening, identification, titration of allo antibodies and phenotyping of feotal blood make it possible to consider immunotherapy or immunoprophylaxis [9]. The knowledge of the phenotype of the partner makes it possible to predict the risks of maternal foeto incompatibility. The Kleihauer test is routine in exposed women, who are bleeding, miscarried, and after each delivery. This test allows early detection of allo immunization [10]. Similarly, non-phenotyped blood transfusions are formally prohibited in women of childbearing age in many Western countries such as France, Norway, Finland [11]. This is not always the case in our country. With regard to the consequences of foeto-maternal alloimmunization (the risk of fetal or neonatal involvement, which may lead to an in-utero death, anemia, haemolytic disease of the newborn (HDN), nuclear jaundice [12], it is urgent to take some prophylactic measures in our country. In particular, the management of pregnant women alloimmune or susceptible to be immunized; systematic search for irregular agglutinins; the phenotyping of the baby and the father. As for the distribution of Rhesus and Kell phenotypes, in our study population, the combinations Dce, DCEe, DEce were in descending order more representative; while K+, DCEe, DCEe, D-c+e + was rare. The distributions of antigenic combinations in rhesus and Kell systems in women was comparable to those found by Amadou Diarra in 2013 in Bamako[13] and Sekongo and collaborators in Abidjan in 2015 [14]. Indeed, in these studies, the D+C-E-c+e+ phenotype was predominant with frequencies of 73% and 49.6% respectively. The results in Abidjan were: D (96%), c (82.1%), e (82.10%), E (17.9%), C (17.9%), K (2.10%), k (97.9%). In our study also, the combinations D +C-E-c+e+, K-, D+C+ E-c+e+, D+C+E-c+e+, in women were the most predominant; K+, DCEce, DCEe, dce have been rare. Antigens, D, c, e, K- were predominant and K + rare. The combination of results would be related to race. Indeed, the frequencies observed for the phenotypes and for the antigens are clear with those observed in Caucasians and Asian originals: D + C + E-c + e + (34%), D + C + Ec-e + (20%). %), D + C + E + c + e + (13%), D-c + e + (15%), D + C-E + c + e + (12%), K + (9%) [15].

CONCLUSION

We have been able to demonstrate the existence of irregular agglutinins in non-transfused multiparas and polytransfused women. Allo immunization rates were high in multiparas without a history of transfusion. The Rhesus and kell phenotypes of our study population have been described. All this leads us to say that the search for irregular agglutinins and the complete phenotyping would make it possible to limit the allo immunization in the non transfused multiparous and the polytransfused women. To reduce the risk of allo immunization in Cameroon phenotype at least in rhesus and Kell systems, the search for irregular agglutinins must be done routinely in transfusion therapy and in obstetrics and transfusion of non-phenotyped blood should be formally prohibited in the general population; especially among women of reproductive age

Conflict of interests

The authors declare that they have no conflict of interest in relation to this article.

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