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Frequency and specificity of red blood cells alloantibodies among Sudanese multiparous women

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Running head: Allo-immunization among Sudanese Multiparous Women

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Abstract:

Background: Allo-immunization is a condition in which the body gains immunity, from another individual of the same species, against its cells. Blood group antibodies are called alloantibodies if they react with alloantigens on the red blood cells (RBCs) of other individuals. Immune antibodies are produced following exposure to foreign erythrocyte antigens through pregnancy or transfusion. Maternal alloimmunization, also known as iso-immunization, occurs when a woman's immune system is sensitized to foreign erythrocyte surface antigens, stimulating the production of immunoglobulin G (IgG) antibodies. **Purpose:** This study aimed to detect the frequency and specificity of alloantibodies against (RBCs) antigens among Sudanese multiparous women.

Methods: This cross-sectional study was conducted on randomly selected 130 pregnant ladies, most of them were attending Soba teaching hospital and the remaining to Khartoum teaching hospital during the period from February-2008 to May-2008. Serum from each lady was collected. Each sample was grouped and screened for alloantibodies, then samples with positive antibody screening were tested for antibody identification using the gel agglutination method. **Results:** The overall frequency of alloantibodies detected among studied pregnant ladies was 10.8%. The results also revealed that an insignificant correlation was found between age, ethnic group, and presence of alloantibodies ((*P-value*: > 0.05); While a significant correlation was observed between the history of abortion, and the number of pregnancies and presence of alloantibodies (*P-value*: < 0.05).

Conclusion: In summary, we concluded that the alloantibodies were detected in one-tenth of the studied subjects with a significant association between detected antibodies and the number of pregnancies**.**

Keywords: Allo-antibody, Multiparous Women, Antibody Screening, Antibody Identification.

Introduction:

The study of red blood cell (RBCs) antigens and antibodies forms the foundation of transfusion medicine. Since Landsteiner's discovery in 1901 that human blood groups existed, a vast body of serological, genetic, and more recently biochemical data on red cell blood-group antigens have been accumulated. About 200 red cell antigens have been described, most of which have been antigens to well-defined blood-group systems. Most of these antigens were detected by antibodies stimulated by transfusion or pregnancy [(1)].

Alloimmunization is a condition in which the body gains immunity, from another individual of the same species, against its cells. Allo-immunity should not be confused with autoimmunity in which the body's immune system attacks its cells without being provoked

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or influenced by substances or cells from another member of the same species. An alloantigen is an antigen that is a part of an animal's self-recognition system. When injected into another animal, they trigger an immune response aimed at eliminating them. Therefore, it can be thought of as an antigen that is present in some members of the same species but is not common to all members of that species. [(2)]

Blood group antibodies are called alloantibodies if they react with alloantigens on the red blood cells (RBCs) of other individuals. Immune antibodies are produced following exposure to foreign erythrocyte antigens through pregnancy or transfusion [(3)].

Maternal alloimmunization, also known as iso-immunization, occurs when a woman's immune system is sensitized to foreign erythrocyte surface antigens, stimulating the production of immunoglobulin G (IgG) antibodies. The most common routes of maternal sensitization are via blood transfusion or feto-maternal hemorrhage (ie, transplacental passage of fetal erythrocytes) associated with delivery, trauma, spontaneous or induced abortion, ectopic pregnancy, or invasive obstetric procedures. These antibodies can cross the placenta during pregnancies in allo-immunized women and, if the fetus is positive for the erythrocyte surface antigens, resulting in hemolysis of fetal erythrocytes and anemia. This, in turn, can lead to potentially disastrous consequences for the fetus, such as hydrops fetalis, a high-output cardiac failure syndrome. IgG antibody-mediated hemolysis of fetal erythrocytes, known as hemolytic disease of the fetus and newborn (HDFN), varies in severity and can have a variety of manifestations [(4)].

Materials and Methods:

The study was conducted on randomly selected 130 pregnant ladies who have four or more gestations; most of them were attending Soba teaching hospital and the remaining to Khartoum teaching hospital during the period from February to May-2008.

Three milliliters (ml) of venous blood were collected from each lady, in a plain container. Serum from each sample was separated. Each sample was grouped and screened for alloantibodies, then samples that give positive antibody screening were tested for antibody identification using the gel agglutination method

Ethical consideration:

This study was approved by the ethical committee at Al-Neelain University, Khartoum-Sudan, and informed consent was obtained from all ladies, any participant who is not willing to participate in this study was not forced to participate. They were also informed that all data obtained from them would be kept confidential.

Results:

The frequencies of alloantibodies against one of the major blood group systems (rhesus {Rh}) and some of the minor blood group systems (Kell, Duffy l{Fy}, Lewis {Le} and MNSs were studied in 130 multigravida women. Ladies were grouped and screened; antibody screening was performed on all pregnant women, irrespective of whether they are Rh (D) positive or Rh (D) negative. 123 were Rh (D) positive (94.6%) and 7 were Rh (D) negative (5.4%). Antibodies were detected in 14 ladies (10.8%). (Table: 1). 50% of ladies with positive antibody screening were B. Rh (D) positive, while the remaining were A Rh (D) Positive (28.6%), O Rh (D) positive (14.3%), and O Rh (D) negative (7.1%). (Table: 2). Antibody identification was performed for cases with positive antibody screening and the identified antibodies were anti-Le^a (4, 28.57%), anti-C^w (2, 14.29%), anti E (2, 14.29%), anti-S (1, 7.14%) and (5, 35.71%) were difficult to interpret whether they were anti-Kell or anti-Lu^b. (Table: 3). There was no case of anti D detected in Rh (D) negative subjects.

A significant correlation was detected when alloimmunization firstly correlated to the number of pregnancies (*P.value*: 0.021). Then, when secondly correlated to history of abortion (*P.value*: 0.024).

Table 1: Frequency and percentages of antibody screening among the study population

Antibody Screening	Frequency	Percentage
Positive	14	10.77%
Negative	116	89.23%
Total	130	100.00%

Table 2: Frequency and percentages of ABO, Rh (D) groups in positive cases

ABO Rh D Groups	Frequency	Percentage
A Rh (D) Positive	4	28.57%
B Rh (D) positive	7	50.00%
AB Rh (D) positive	0	0.00%
O Rh (D) positive	2	14.29%
A Rh (D) Negative	0	0.00%
O Rh (D) Negative	1	7.14%
Total	14	100.00%

Table 3: Frequency and Percentage of identified antibodies among cases with positive antibody screening

Identified Antibodies	Frequency	Percentage
Anti Kell or anti Lu ^{b}	5	35.71%
Anti Le ^{a}	4	28.57%
anti C ^{w}	2	14.29%
anti E	2	14.29%
anti S	1	7.14%
Total	14	100.00%

Discussion:

The blood group antigens are stable characteristics controlled by genes inherited in a simple Mendelian manner [(5)]. The frequencies of alloantibodies against one of the major blood group systems (rhesus {Rh}) and some of the minor blood group systems (Kell, Duffy l{Fy}, Lewis {Le} and MNSs are studied in 130 multigravida women.

Allo-Antibodies were detected in 10.8% of studied ladies and this finding agrees with the findings of Jalada Patel *et al* 2009 who reported a frequency of 10.2% among Indian multiparous women [(6)].

The antibody specificity of antibodies was mainly anti-Le^{a}, anti-C^{w,} anti E, anti S, and some of them were difficult to interpret whether they are anti-Kell or anti-Lu ^{b}, these findings differ from results published by Jalada Patel *et al* 2009 which reported that the antibody specificity of antibodies was mainly in Lewis, Rh, Kidd, and MN systems.

The percent study reported that there was an insignificant correlation between age, ethnic group, and alloimmunization with a p-value (0.78, 0.27) respectively. On the other hand, a significant association was observed between the history of abortion, the

number of pregnancies, and alloimmunization with a p-value (0.024, 0.021) respectively.

Conclusion:

In summary, we concluded that alloantibodies were detected in one-tenth of the studied subjects with a significant association between detected antibodies and the number of pregnancies. Antibody screening should be carried out for multiparous women so that the ladies having antibodies against red cell antigens are managed properly.

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