

The Distribution of ABO and Rh Blood Groups in a Sample of Pregnant Women in the Eastern Province of Saudi Arabia

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ABSTRACT. The ABO and Rh (D) blood group systems of a very large number of homogenous pregnant women from the Eastern Province of Saudi Arabia have been determined by tests on both red cells and serum. High frequency of group O blood was observed in the sample population (45.3%). Rh (D) negativity was found to be rare in these areas, (1.9%).

The ABO blood group system was discovered by Landsteiner (1900) on erythrocytes, and were the first major alloantigens recognized in humans (Clausen and Hakomori 1989) These are responsible for failure of unmatched blood transfusions. Blood group A individuals have A antigens on the red cells and anti-B in the serum. Blood group B individuals have B antigens on the red cells and anti-A in the serum. AB individuals have both A and B antigens on the red cells but no antibodies A or B in the serum and O individuals have both anti-A and anti-B in the serum but neither A nor B antigens on the red cells (Yamamoto 1995). Later, ABO phenotypes were shown to be an inherited characteristic, and in 1924, the one gene locus-three allelic model was proposed by Bernstein to explain the inheritance mode of this genetic trait (Yamamoto *et al.* 1990).

The Rhesus (Rh) blood group antigens are clinically the most important proteins. They are the most frequent targets of alloantibodies produced by

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transfusion recipients as well as by mothers alloimmunized to fetal antigens. The Rh antigen proteins are also frequent targets of autoantibodies responsible for idiopathic and drug-induced hemolytic anemias. Antibodies to Rh antigens are usually IgG and rarely fix complements. Nevertheless, they may induce rapid extravascular clearance of antibody sensitized cells. The first Rh antigen to be defined was The D antigen. This antigen may be expressed or absent giving rise to the D-positive and D-negative phenotypes, respectively (Hoffman *et al.* 1995).

In spite of the importance of ABO frequency in blood transfusion there are no studies related to variation in the frequencies of these blood types in the Eastern Province of Saudi Arabia, which prompted this work conducted from different hospitals in Dammam, Qatife, and Dhahran. The work was done on pregnant women only in order to assess needs for transfusions as well as to determine the origin of the population.

Materials and Methods

Several medical centers for delivery were used, during this study in Dammam, Qatife, and Dhahran cities. To ensure homogeneity of the study group, only those subjects who were originally from Eastern Province were included in the study.

Samples of anticoagulated blood were taken from 576 pregnant women who were attending routine antenatal clinics at the time of delivery. ABO blood group and Rh (D) positivity were determined by the tube method using (Ortho Diagnostic Systems, US) Reagents, as follows; Human polyclonal and mouse monoclonal IgM anti-A and anti-B were used to determine the ABO type of subjects. These antibodies directly agglutinate red blood cells at room temperature. To confirm a subject's ABO type, the presence of the corresponding serum isoagglutinins was also determined by incubating the serum at room temperature with commercially available group A and B red blood cells.

Red blood cells of pregnant women were also tested for the presence of the D-antigen of the Rh system. anti-D reagent is a chemically produced IgG antibody that directly agglutinates D-positive red blood cells suspended in saline at room temperature (Chang *et al.* 1992).

Statistical Methods: the analyses for the percentage, and distribution of ABO and Rh blood groups were performed using the Instat software (Instant Biostatistics, Graphpad, package, USA).

Results

A high prevalence of the O blood group (45.3%) was found in these subjects while group A was seen in only (27.3%), Group B in (20.8%) and group AB in about (6.6%). Rh (D) negativity was present in about (1.9%) of the blood samples (Table 1). Upon reviewing the literature in Tabuk and Madinah Munawwara Regions, again a strikingly high prevalence of the O blood group (53%) and (44.8%) were noted in women (Tables 2 and 3) respectively. Rh (D) negativity was noted in about (8%) and (11%) as reported by Ozsoylu and Alhejaily 1987. The frequencies of ABO groups among selected population in the world are presented in Table 4 (Walker 1990).

Table 1. Blood groups of women in the Eastern Province.

ABO	O	A	B	AB
Rh (+) (No.)	250	155	117	36
Rh (-) (No.)	11	2	3	2
%	(4.2%)	(1.3%)	(2.50%)	(5.3%)
Total	261	157	120	38
% of blood type	(45.3%)	(27.3%)	(20.8%)	(6.6%)

Table 2. Blood groups of women in the Tabuk Area*.

ABO	O	A	B	AB
Rh (+) (No.)	85	45	15	8
Rh (-) (No.)	3	5	5	0
%	(3.4%)	(10.0%)	(25.0%)	(0.0%)
Total	88	50	20	8
% of blood type	(53%)	(30.1%)	(12%)	(4.8%)

* Ozsoylu and Alhejaily 1987.

Table 3. Blood groups of women in the Madina Munewera*.

ABO	O	A	B	AB
Rh (+) (No.)	630	408	290	75
Rh (-) (No.)	81	51	39	13
%	(11.3%)	(11.1%)	(11.9%)	(14.8%)
Total	711	459	329	88
% of blood type	(44.8%)	(28.9%)	(20.7%)	(5.5%)

* Ozsoylu and Alhejaily 1987.

Table 4. Frequencies of ABO group in selected populations.

Population (No. Tested)	% of various phenotypes			
	O	A	B	AB
South American Indians (539)	100	-	-	-
Vietnams (220)	45	21	29	4
Australian Aborigines (126)	45	55	-	-
Germans (100000)	43	42	11	4
Bengalis (241)	22	24	38	16
Lapps (324)	18	55	15	12
United Kingdom (500)	47	40	10	3

Discussion

There is a high prevalence of O blood group (65%) in American blacks women (Mourant 1976). The A group is reported to be highest (49%) in Turkish women (Gulmezoglu *et al.* 1983), as is the case in white women in the United States (Mourant 1976). Group O and B are more frequently seen in women of the Arabic-speaking population in Turkey (Mourant 1976). Significant markers such as Rh-hr, Duffy, Lewis, Kidd, and Kell studied in subjects with a high prevalence of haemoglobin S in Turkish women strongly suggest their African origin (Kanra *et al.* 1983) as was demonstrated in Arabs with the same hemoglobinopathy in Palestine (Levene *et al.* 1976).

The high frequency of O blood group is not unique to mothers in the Eastern Province as similar findings were seen in Tabuk and Madinah Munawwara is a strong indication that it is not related to the Eastern Province but that it is most likely common to Saudi Arabia. Therefore, the chance of ABO incompatibility occurring among the offspring of mothers of the O blood group should be taken into consideration more often if the fathers blood group is not O.

The unusual distribution of Rh (D) negativity related to ABO blood groups in Eastern Province was most likely the result of the ethnic origin. However, when it was evaluated in larger samples in Madinah Munawwara and Tabuk, it was still low, (11% and 8%).

Rh (D) negativity is 17% in England (Mollison 1967) and 14.7% in Turkey (Mourant 1976), while it is about (1.9%) in Eastern Province. Due to the relatively low frequency of Rh (D) negativity in Saudi Arabia mothers, erythroblastosis fetalis caused by Rh (D) incompatibility should occur less frequently in this group. The Rh blood group comprises more than 40 individual antigens, of which 5 are routinely identified: D, C, c, E, and e. These 5 reside on three proteins, which are themselves the products of two extremely closely linked genes. The first Rh antigen to be (D +) and second (D -) phenotypes. Because of the tight linkage between the D and C/c/E/e loci, however, these five antigens are inherited en bloc (Hoffman *et al.* 1995). Certain genotypes are more common than others, although gene frequencies vary from one population to another. However, the more frequently reported among people of Afro-American ancestry (Mollison 1967). With the Rh (D) determination, the frequency of Rh negativity most likely would be less, suggesting more African blood group markers in Saudi Arabia.

Before making any conclusions regarding the blood group markers in the Saudi Arabia population, the results of these determinations should be gathered from all parts of this large country.

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توزيع فصائل الدم والعامل الرايزيسي على عينات من النساء الحوامل في المنطقة الشرقية من المملكة العربية السعودية

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تمت الدراسة عن توزيع فصائل الدم والعامل الرايزيسي على ٥٧٦ عينة
أخذت من النساء الحوامل في المنطقة الشرقية من المملكة العربية السعودية
والذي حدد بواسطة تحليل الخلايا الحمراء ومصل الدم ، وأعلى نسبة وجدت
لفصيلة الدم أوه (O Blood group) ، (٣ ، ٤٥٪) مقارنة مع فصائل الدم
الأخرى . وبالنسبة إلى العامل الرايزيسي السلبي وجد في نسبة ٩ ، ١٪ وهي
قليلة جداً . ونشير إلى إجراء مزيد من الدراسات لمعرفة نسبة أنواع فصائل الدم
المختلفة في جميع مناطق المملكة للتمكن من تحديد نسب فصائل الدم في
المملكة العربية السعودية .