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Hematology

The frequency of ABO, Rh Antigen, and Phenotypes, among Halanga Sudanese Ethnic Group

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Abstract **Original Research Article**

Background: frequencies of blood groups differ between populations. Were the differences the result of random genetic drift and founder effects, in small populations which later multiplied and stabilized the original, fortuitous, frequencies? **The aim** of this study is to determine the frequency of ABO and Rh antigens and phenotypes among Elhalanga ethnic. Grou This prospective and analytical study, aimed to determine the frequency of ABO, Rh antigen, and phenotypes, among Halanga Sudanese Ethnic group. Also aims to establish ABO, Rh blood group baseline data for this Sudanese tribe to determine the similarity between this tribe and other Sudanese tribes which will be useful in the blood transfusion**.** ***Materials and Methods:*** the study was conducted in Sudan (Kassala state) during period of April to July 2007, followed informed consent, 100 unrelated volunteers from (Al Halanga) ethnic group of different ages of both gender.All samples were tested for Blood Grouping and Rh D antigen using the slide agglutination techniques, and the same samples tested for Rh C, c, E, e, and kell1 antigens by immunodiffusion gel technique. ***Result and Conclusions:*** The results showed that, The O group was most common frequently occurred (47%), followed by group A (28%), group B was found (22%) and least common was group AB (3%). The e, c, and the D antigens were the commonest alleles detected with frequencies of 96%, 91% and 82%, respectively. The C and the E antigens were the least frequent with 40% and 15% frequencies respectively. There was a marked similarities between the Sudanese tribes that lived in same geographical area this could be due to intermarriage , while the difference that seen in some tribes could be most probably due to the wandering nature of these tribes.

Keywords: Blood group, Rh system, phenotypes, Ethnic group.

INTRODUCTION

Blood group antigens were not yet discovered at the start of blood transfusion, which was first carried out between dogs by Dr. Richard in February 1666. The first transfusion to a human was from animal that performed by Professor J. Denis. Blundell [1] was the first who performed a human to human blood transfusion, and before that he had established two very important points: the first was that a dogs which had been bled could be revived by a transfusion of dog's blood and the second was that a transfusion to a dog of even a small amount (114 ml) of the blood of another species (human) could be fatal; indicating the need to use a donor of the same species. This was fully confirmed by Ponfick [2] who showed that if the red cells of a donor of another species were transfused, they underwent rapid intravascular lysis [2] ABO system of human erythrocyte in 1900 the important. Of blood group in clinical transfusion practices and hemolytic diseases of newborn, was soon recognized and through investigation led to discovery of a vast number of red cell antigen characters. More than 800 erythrocyte antigens have been defined, while some of these antigens are common red cell characteristic in given population, other may be extremely rare and found only in one family significant differences statistical frequency have been observed between different races [3].

Blood group antigens not quite unique as finger prints but there are well – defined differences in their incidence between different ethnic origins [3]. The Rh blood group system was the fourth system to be discovered, yet it is the second most important in blood transfusion medicine. It was first described 60years ago [4].

OBJECTIVES

General objectives

- To determine the frequency of ABO and Rh antigens and phenotypes among Elhalanga ethnic Group.
- To compare the results obtained by conventional anti – sera (slide and tube methods) with those obtained by Gel immune -diffusion technique.

Specific objectives

- To determine the possible ABO frequency in Elhalanga ethnic Group.
- To determine the possible Rh antigen and phenotypes frequencies in Elhalanga ethnic Group

MATERIALS & METHODS

This is cross-sectional, descriptive hospital-based study conducted in Gaffer Ib no of Hospital; Khartoum state, Sudan. The study was conducted on 160 unrelated sickle cell patients 'volunteers also 60 healthy volunteers were used as control group. Venous blood was collected from the anti-cubital vein of both study and control group and subjected for RhD grouping method for determination of D antigen and Gel Immune Diffusion Technique to determine Rh C, c, E, e and Kell1. Self-administered pre-coded questionnaire including all personal information including (name, age, race and some personal altitudes were collected from each patient, in order to facilitate the selection of patients on the basis of the disease. Interpretation of results RhD grouping method: Positive reaction is indicated by clumping of cells (agglutination) where negative reaction shows no clumping and the red cells appear free and the preparation was homogeneous. Agglutination with anti-D anti-sera indicates the presence of the Rhesus antigen. Absence of reaction with anti-D anti-sera requires performing Du method; to confirm either the absence of Rhesus D antigen or the presence of weak D antigen.Gel Immune Diffusion Technique: Agglutinated cells forming a red line on the surface of the gel or agglutinates dispersed in the gel indicates a positive reaction of ++++ to + which indicates the presence of corresponding antigen. A compact button of cells on the bottom of the micro- tube indicates a negative reaction i.e. the absence of the corresponding antigen.

RESULTS

Characteristic of the study

This study has been designed to determine the frequency of ABO and Rhesus phenotype of a minor Sudanese tribe (Al Halanga Ethnic group) of different ages and both sex (male 74% and female 24%) as in table 4.1.

ABO Blood Group System

Table 4.2 respectively show frequencies and percentage of ABO blood group among Al Halanga Ethnic group we found that there were 28 % group A, 22 % group B, 3 % group AB and 47 % of them were group O. The result showed high frequency of group O and Low frequency in group AB.

Rh Blood Group System

The Alleles e, D, and c were the most frequent in the study tribe (Danagla tribe) with the percentage of 96%, 82%, and 91% respectively, while C and E were reported at lower frequencies of 40% and 15% respectively. The D^u antigen is very rare has 0% frequency as in table 4.3.

The low phenotype percentage is cdE found in 1% and the cDe is high pheno type percentage in 30% as in table 4.4. Table 4.5 and figure show the relation between ABO and Rh antigens, a big relation in group O with E (Ag) in which 58 % of this group has E Ag, and there is no relation between AB and E, e (0%).

Table-4.1: The Sex –Related Incidence Distribution in Alhalanga Ethnic Group:

Sex	Frequency	Percentage %
Male	76	76
Female	24	24
Total	100	100

Table-4.2: The Frequencies and Percentage of ABO Blood Group Distribution among Alhlanga Ethnic Group

Blood group	Frequency	Percent %
A	28	28
B	22	22
AB	03	03
O	47	47
Total	100	100

Table-4.3: The Rh Fisher Incidence Distribution among Alhalanga Ethnic Group

Rh (antigen)	D (%)	C (%)	c (%)	E (%)	e (%)
Positive	82%	40%	91%	15%	96%
Negative	18%	60%	09%	85%	04%
percentage	100%	100%	100%	100%	100%

Table-4.4: The Expected Frequencies and Percentage of Rh Phenotypes Distribution among Alhalanga Ethnic Group

Rh Phenotype	CcDe	CcDEe	Ccde	cDEe	CcDE	CDe	cDE	cDe	cdE	cde
Positive	20	3	7	8	5	9	3	30	1	14
percentage	20%	3%	7%	8%	5%	9%	3%	30%	1%	14%

Table-4.5: The Relation between ABO and Rh Antigens Distribution among Alhalanga Ethnic Group

Rh (antigen)/ ABO	D (%)	C (%)	c (%)	E (%)	e (%)
A	27%	18%	23%	25%	31%
B	21%	25%	21%	16%	25%
AB	3%	3%	0%	0%	3%
O	49%	53%	46%	58%	37%

Table-4.6: Comparison between Agglutination and Immunodifuison Technique

Test		I. D Test		Total
		+ve	-ve	
Agglutination	+ve	28	0	28
Test	-ve	0	2	2
Total		28	2	30

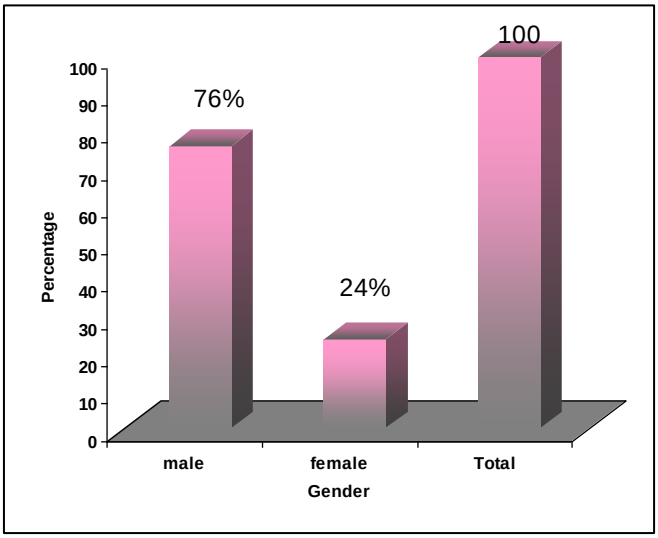

Fig-4.1: The Sex –related incidence distribution in Alhalanga Tribe

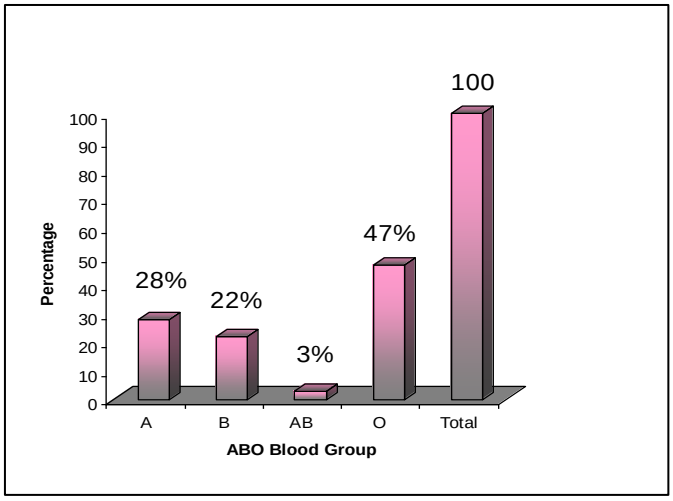

Fig-4.2: The Frequencies of ABO Blood group distribution among Alhalanga Ethnic group

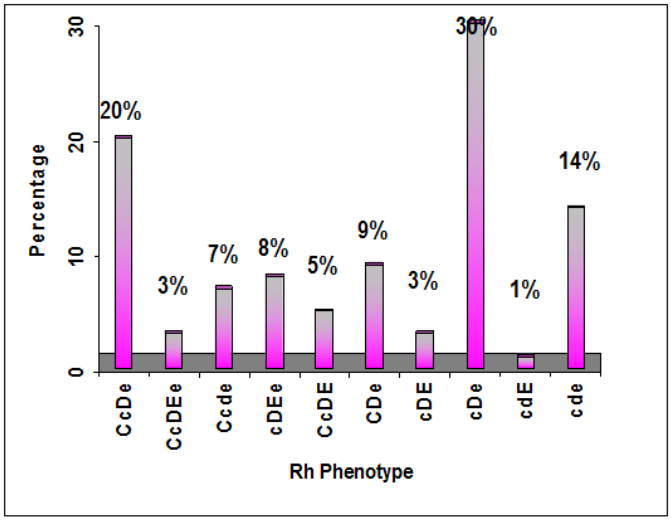

Fig-4.3: The Expected Frequencies and percentage of Rh Phenotypes distribution among Alhalanga Ethnic group

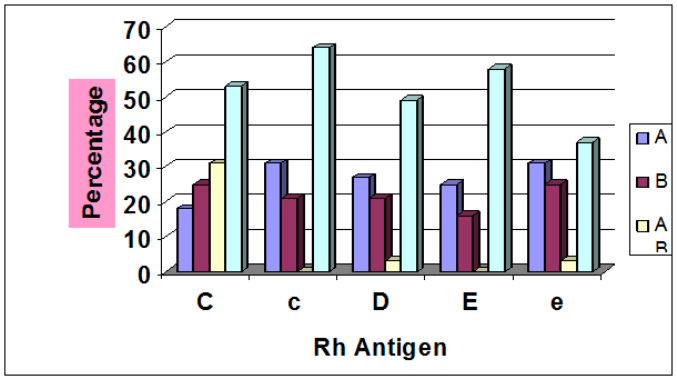

Fig-4.4: The relation between ABO and Rh antigens distribution among Alhalanga Ethnic group.

DISCUSSION

The importance of ABO Blood group system in blood transfusion lies in the frequency of its antibodies and in the possibility that such antibodies will destroy incompatible cells in vivo , because blood transfusion from incompatible groups can cause an immunological " transfusion reaction " result in haemolysis, anemia, renal failure, shock and death.

The ABO and Rh system is the most important due to the fact that Rh antibodies in plasma of recipient of blood transfusion are capable of casing sever hemolytic transfusion reaction if the patient is transfused with blood possessing the corresponding antigen, so the antibodies must be considered to be very importance clinically [4].

Determination of different blood group systems is of clinical important like in blood transfusion, in surgery and in tissue transplantation, also it may be, associated with many serological problems like HDN [4]. In the present study the distribution of different blood groups (ABO and Rh) were determined in (100) subjects from Sudanese tribe "Ahalanga" Ethnic group were studied.

The distribution of ABO phenotype in the present study showed that population with O phenotype recorded highest frequency (47%) followed by A, B and AB which was lower frequency (3%) and the order was represented as O > A > B >AB and the order of common Rh phenotype was D and e present with high frequencies followed by c, E and C which is lower frequency.

This study show similarity with other studies conducted distribution of blood groups among city Mashhad in North East of Iran done by Boskabady MH, *et al*. [5] whom suggested that blood group O with high frequencies 34.7% followed by A 33.1%, B 23% and AB 8.9% respectively the result also showed 88.7% Rh (D) positive and 11.33% are Rh (D) negative.

Also in Nigeria few published works on frequencies of the ABO among ethnic groups/tribe were encountered the first was that of Worlledge-et al who reported frequencies among Yoxuba and Hausa as the following 58% group O , 21% A,17% B and 2% group AB this finding were agreement with result of our study. In addition, study showed high frequency of Rh (D) antigen 96.77%[6].

In blood group O the H antigen remains unchanged and consists of chain of galactose, N-Acetylglucosamine, galactose,and fucose. H antigens can be changed into A or B antigens by enzymes code the blood group A or B genes so the individual present with blood group O[7].

With regard to transfusions of whole blood or packed red blood cells, Individuals with type O negative blood are often called universal donors, Although blood donors with particularly strong anti-A, anti-B or any atypical blood group antibody are excluded from blood donation, the terms universal donor is an over-simplification, because they only consider possible reactions of the recipient's anti-A and anti-B antibodies to transfused red blood cells, and also possible sensitization to Rh(D) antigens.

The possible reactions of anti-A and anti-B antibodies present in the transfused blood to the recipient's RBCs are not considered, because a relatively small volume of plasma containing antibodies is transfused.

High frequency of group O in the present study has an advantage in terms of availability of blood for transfusion in this tribe especially in emergency cases, however, some level of caution to be considered. Some group O plasma is known to contain potent immune hemolytic anti A anti B antibodies so routine hemolysin test on every group O blood should be done to reduce risk of transfusion reaction. There is compatibility with study of ABO and Rh (D) blood group in Kodide Reddis of Anantapur District, Andhra Pradesh done by K-S-N Reddy and B-K-C Reddy whom suggested that group O was present with high frequency 45.26% and AB with lower frequency 7.37 but in contrast different results obtain in groups (B, A) B 31.05% and A 16.32% so the order was O > B > A > AB[8].

Our results were revealed that the frequency of O blood group was 50% which was greater than that found in Beni Amir tribe [1], Guraan tribe of [9], El Arakieen [10]. Marked similarities in the frequency of e, c, D, & C between our study group (Al Danagla tribe), Al Shaigia, and Al Mahas, but differ in E antigen frequency, like the similarity between Al Kawahla & Al Halaween, and between Beni Amir, & Al Hadandawa in the frequency of e, c, C, & E alleles) allow to categorize these populations into the same group. The E allele/ antigen were strikingly low in our study tribe and some Nilo-Saharan/Nubian tribes like ANuba, and Al Shuluk.

CONCLUSION

The O blood group is the most common phenotype in Al Halanga tribe, and the AB blood group was the least common phenotype. The RhD- positive individuals were more prevail.

The antigen (c) was found to be the highest frequency, followed by (e) antigen. Comparison between the distribution of ABO and Rh blood group systems in our study group with those of several other studies in the other countries showed marked similarity in both, but show significant difference with populations of India. Our finding confirms that (the distribution of blood group in different areas of the world varies which is perhaps due to genetic difference between different populations. The antigens E, C were present with low frequency among study group Sensitivity and specificity of the gel technique due to use card coated with monoclonal Antibody was useful to avoid problems that may occur in the manual technique

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