

Pattern of ABO and Rhesus Blood Groups Distribution of Five Years Survey in Jimma Town Blood Bank, South West Ethiopia

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Abstract

Background: For the effective management of blood banks and safe blood transfusion services, understanding ABO blood group types and Rhesus (Rh) factor distribution at local and regional levels is very essential.

Objective: To determine and compare the five years, 2010-2014, distribution of ABO and rhesus blood groups in Jimma Town blood bank, South West Ethiopia.

Materials and methods: A retrospective cross sectional study was conducted to determine the distribution of the type ABO blood group and Rh factor among blood donors of Jimma town blood bank. For those individuals available to donate blood during study period, we used an interview based structured questionnaire to collect socio-demographic and other clinically useful data. But non study period data, we used a check list to retrieve data from record. Descriptive statistics, including frequencies and percentage were used to present data in text and tables.

Results: At the ABO blood group system, type O was the commonest type accounting for 43.1% followed by type A and B accounting for 31.9% and 21.5% respectively. The AB blood group type was the least common accounting for 3.5% sample. From Rh blood group, 92.8% subjects were Rh positive whereas 7.2% were Rh negative.

Conclusion: The study reports the pattern of blood groups among the people in and around Jimma Town, South West Ethiopia and would help the blood bank to prepare database and increase awareness which type of blood group should be stored more. So, the study has a significant implication regarding the inventory management of blood bank and transfusion services for those who need blood transfusion.

Keywords: Blood type; Jimma

Introduction

Blood group antigens have hereditary nature and play a vital role in transfusion safety, understanding genetics, inheritance pattern, and disease susceptibility [1,2].

The first person to put forward the ABO blood group system in 1900 was Karl Landsteiner. Nearly 700 erythrocyte antigens are described and organized into 30 blood group systems by the International Society of Blood Transfusion of which ABO and Rh blood group systems are important [3,4]. According to the presence of antigens and agglutinins patterns, ABO blood group individuals are divided into four major blood groups namely, A, B, AB and O [5,6]. Group O blood has neither A nor B antigens, group A blood has type A antigens and group B blood has type B antigens. Also plasma from blood O has both A and B antibodies, plasma from blood group A contain Anti-B antibodies which act against type B antigens, whereas plasma from type B blood contains Anti-A antibodies, which act against type A antigens and type AB has neither type of antibody [7,8].

The second most important blood group system is rhesus (Rh). In this blood group system the Rhesus antigen (named because a related antigen was first discovered in Rhesus monkeys) is found on the surface of red blood cells [9,10]. Individuals who have RhD antigen on

the surface of their red cells are positive for Rh and those who do not have this antigen on the surface of their red cells are negative Rh [11].

The frequencies of ABO and Rh blood groups vary from one population to another and time to time in the same region [9,11]. For the effective management of blood banks and safe blood transfusion services, understanding ABO and Rh blood groups distribution at local and regional levels is very essential [8-10].

To prevent erythroblastosis fetalis that commonly occurs when an Rh negative (Rh-ve) mother carries an Rh positive (Rh +ve) fetus, it is very important to identify Rh blood group system [11,12].

For the effective blood banks inventory management whether it is a smaller local transfusion service facility, a regional or national transfusion service it is important to have the knowledge of ABO and Rh blood group distribution [13,14].

To know the distribution of blood group is also important for clinical studies, for reliable geographical information and as reducing maternal and premature mortality rate [15,16]. It is also important to use ABO and Rh blood group studies for genetic studies, for doing research in population migration patterns in addition to resolving certain medico-legal issues particularly in case of disputed paternity [16,17]. Blood group relation to disease and environment is also progressively more important in modern medicine [12,16]. There is no any research done to give full information about the distribution of

blood group in the study area i.e., south West Ethiopia. So, this study was aimed to give full information about the distribution of blood groups among the population groups of the study area [12,18,19].

Materials and Methods

Study area and period

The study was conducted from November 2014 to January 2015 at Jimma blood bank of Jimma town. Jimma town is located at 350 kilometers to South West from capital city of Ethiopia, Addis Ababa. The town has an altitude of about 1760 meter above sea level with temperature ranges from 11.5°C to 27.1°C and rain fall ranges between 1200 mm to 2000 mm. Approximately 200,000 individuals of different ethnic groups are living in this town.

Study design and subject

A retrospective cross-sectional study was conducted to determine the distribution of ABO blood group system and Rh factor. Blood donors who were available during data collection period were selected after proper history taking and complete examination to identify their fulfilling eligibility criteria to donate blood. Those individuals who fulfilled the eligibility criteria were included as study population. The registration book was also assessed to collect socio-demographic and other useful data to determine the distribution of ABO blood group system and Rh factor.

Data collection techniques and analysis

An interview based structured questionnaire was used for those individuals available during data collection to collect socio-demographic data such as sex, age, birth place, educational status as well as certain clinically useful data such as history of infection for malaria, history of hospitalization for cardiac problem and from those variable we used only sex and age for this manuscript. But for non-study period collected data we used a check list retrieve data from their record. An interview based questionnaire was used to collect data from study subjects who were available during study period and a check list was used to collect secondary data from registration book. Descriptive statistics, including frequencies and percentage was used to present data in text and tables.

For study participants available during data collection period to donate blood, blood samples were collected by finger prick method aseptically. The ABO blood grouping and Rh factor typing was determined by glass slide method. The glass slide method was based on antibody antigen agglutination and the blood group was determined based on agglutination. Commercially available standard anti-sera A, B and D were used for the study. Three slides were labeled as A, B and D. A drop of whole blood was added on each slide labeled. A drop of commercially available anti-sera A, B and D were added on slides labeled as A, B and D respectively and then mixed by using different applicator sticks for each slide. Based on agglutination observed the blood group was determined with the corresponding anti-sera. If agglutination was observed on slide labeled A, it belongs to A blood group, if observed on B, blood group type B, if agglutination was observed on both slide labeled as A and B, AB blood group but if no any agglutination was observed on both O blood group. Similarly if agglutination was observed on slide labeled as D, because a drop of commercially available anti-D and a drop of whole blood were mixed, it is Rh positive but if no agglutination was observed it is Rh negative.

Ethical consideration: This five year data were collected after ethical clearance obtained from the School of Medical Laboratory Science & Pathology, College of Health sciences, Jimma University. After discussing the aim of the study and clarifying that we use the collected data only for the purpose of this study, permission letter to collect the data was awarded.

Results

From the total of 6922 individuals screened for blood group types at Jimma Town blood bank, 5304 (76.6%) of them were males whereas the rest 1618 (23.4%) of the were females. From the total males screened for blood group types, 2320 (43.7%) were O blood group type, whereas types A, B and AB were 1625 (30.6%), 1168 (22.02%) and 191 (3.6%) respectively (Table 1).

From the total individuals screened, 6425 (92.8%) of them were Rh positive and 497 (7.2%) were Rh negative. Of the total O blood group male individuals, 2151 (92.7%) of them were Rh positive and 169 (7.3%) of them were Rh negative blood type. From total female with O blood group type, 591 (89%) of them were Rh positive and 73 (11%) of them were Rh negative (Tables 2 and 3).

Blood groups	Sex				
	Male		Female		Total (%)
	No	%	No	%	
A	1625	30.60%	580	35.80%	2205 (31.9%)
B	1168	22.00%	322	19.90%	1490 (21.5%)
O	2320	43.70%	664	41.00%	2984 (43.1%)
AB	191	3.60%	52	3.20%	243 (3.5%)
Total	5304	76.60%	1618	23.40%	6922 (100%)

Table 1: Sex wise distribution of ABO blood groups in the total sample.

Table 1 Indicates that O blood group type was the major blood type in the total sample (43.19%) as well as in the male and female samples.

Rhesus blood group	Sex				
	Male		Female		Total (%)
	Subject	%	Subject	%	
Rh +ve	4947	93.30%	1478	91.30%	6425 (92.8%)
Rh -ve	357	6.70%	140	8.70%	497 (0.2%)
Total	5304	76.60%	1618	23.40%	6922 (100%)

Table 2: Sex wise distribution of Rh blood groups over a period of five years.

Table 2 Indicates Rh +ve are the major Rh blood group among male and female individuals accounting for 93.3% and 91.3% respectively.

Age (in years)	O			A			B			AB			Total for age group
	+v	-ve	Total	+v	-ve	Total	+v	-ve	Total	+v	-ve	Total	
18-23	929	100	1029	631	56	687	473	31	504	86	4	90	2310
24-29	986	85	1071	899	52	951	560	34	594	92	8	100	1268
30-35	300	16	316	115	11	126	168	9	177	28	0	28	647
36-41	275	12	287	238	10	248	76	7	83	11	2	13	631
42-47	181	20	201	120	10	130	85	8	93	9	11	20	444
48-53	66	5	71	54	6	60	37	2	39	1	1	2	172
54-59	9	0	9	3	0	3	0	0	0	0	0	0	12
Total	238	298	536	145	220	365	91	149	240	26	243	6922	

Table 3: Age wise distribution of ABO and Rh blood groups over a period of 5 years.

Discussion

This study revealed large male donors when compared to female donors as similar study conducted in India [10]. Less female numbers might be due to fear of blood donation, certain cultural habits or might be due to lack of motivation. The most age group for blood donating in the study area was found between 18-23 age ranges. Individuals with age group greater or equal to 54 years were less blood donating group. This finding is similar to other studies [11,12]. Similar to other studies [10,16], o blood group the commonest type of blood group in our study and AB blood group donors were the least blood group type. Unlike other studies [3,16], blood donors with A blood group type were greater than donors with B blood group types in our study. Similar to other studies [8,9] Rh positive blood group system were much greater than Rh negative blood group system in the current study. Similar to other studies [7,16], O negative was the commonest among the Rh negative blood groups followed by A and B blood group types. AB negative was the rarest.

Conclusions and Recommendation

Male individuals were donating blood than females according to the current finding. The study confirms that O blood group type was the commonest among blood donors of the study area and AB blood group type was the rarest. Individuals with age group 18-27 were the commonest age at which individuals are donating blood. Rh positive blood system is much more common than Rh negative blood system. Therefore, knowledge of blood group distribution is very essential for

clinical studies as well as for blood bank management in any population.

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