

THE DISTRIBUTION OF ABO BLOOD GROUPS AMONG BASRAH GOVERNORATE POPULATION

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Abstract

ABO blood grouping is currently considered as one of the essential immunological tests done before many clinical interventions; on the top of them are clinical blood transfusion procedures.

In a period of 14 months, 620 blood samples were collected from normal individuals including 294 males & 326 females after demographic study of each one. Samples were tested for ABO grouping using the standardized methods.

Results were analyzed statistically using the SPSS analytical system. Results showed that blood group O was the most prevalent type among the whole Basrah Governorate, in all its districts & among both sexes, while the blood groups B & A came next, where as B group was a little bit higher in the whole sample of the Governorate & among females while the A was a little bit higher among males. The AB blood group was the least of the four among all. There was little variation in the distribution of the four blood groups among the different regions of Basrah Governorate but with conservation of the above mentioned graduation. Those results were comparable to the results registered in some neighboring countries, but differ more or less from other far countries.

Introduction

The discovery of ABO blood group system at the end of the nineteenth century laid the foundation for clinical transfusion practice¹. The first discovery of A, B & C (which was later on re-named as O) blood groups was by Karl Landsteiner in 1900-1901. This was followed by the finding of De Castello & Sturli the fourth, AB blood group in 1902^{2,3}. In 1910 von Dungren & L. Hirsfeld had confirmed that the inheritance of A & B characters obeys the Mendelian laws of hereditary, with the presence of the A or B antigens dominant to their absence⁴ and in 1924, the theory of inheritance of the ABO antigens had been postulated by Bernstein as being due to three alleles of genes: A and B, O, and therefore resulting of 6 genotypes AA and BB and AO and BO, and AB and OO, and 4 phenotypes (A,B,AB & O)⁵. Thomson et

al had extended the 3 allele theory of Bernstien into 4 alleles : A1,A2, B & O, hence, discovering the most common A subgroups: A1 & A2⁶. This had been completed by the profound work of: Aaron & Rosenfield, 1964, Mourant 1976 & Yamamoto et al 1990⁷⁻⁹.

The structure & symthesis of A & B antigens was founded by the pioneering work in 1950s of Morga, Watkins & Kabat¹⁰⁻¹².

The ABO Blood Group system is composed of both antigens on RBCs membrane & naturally-occurring antibodies in the serum. Antigens are glycoproteins existing on red cell membrane¹³, composed of 3 components: an H antigen, a glycoprotein, present on the surface of O blood group red cells, which represents the precursor molecule of both A & B antigens. On top of which, either N-

acetyl galactosamine molecule is added to yield the A antigen or D-galactose molecule to yield the B antigen. The A & B antigens expressed on red cells are determined by the A or B genes located on the long arm of chromosome⁹. These genes code for the enzyme glycosyl transferase which attaches different carbohydrates (sugar) molecules to the terminal galactose of H antigen oligosaccharide chain. These oligosaccharide chains are attached to phospholipid on red cell membrane & to proteins (glycoproteins) in plasma^{1,9,11,14,15}.

A & B antigens usually appear on the fetal red cells in the beginning of the 2nd trimester of pregnancy & their antigenicity (estimated by the number of antigenic determinants per each red cell) increases steadily during fetal

development & in post natal life they appear weaker than those of adults (the number of antigenic determinants was estimated around 300 000 & 1000 000 respectively) till reaching that of adults by the age of 3 years³. However, The antibodies in the serum of ABO blood group system are almost always natural, cold-reacting, IgM antibodies that cant cross the placenta & thus cant lead to the development of hemolytic disease of newborn (HDN). They are very weak or negligible in potency during intrauterine & early post natal life. They start to be of considerable importance by the age of 6 months, growing up in potency till by the age of 1 year, when they will be as potent as adults, sera. Yet, immune antibodies of IgG may develop & can thus be the reason of ABO HDN^{3,16,17}(Table I).

Table I: Antigens & antibodies distribution in ABO blood group system⁶.

Blood group	Antigen	Antibody
A1	A + A1	Anti-B
*A2	A	Anti-B (1-5% antiA1)
A1B	A1 + A + B	Anti A
**A2B	A + B	None
B	B	None (25% Anti A1)
O	None	A + B

* 5.1% have anti A1 in serum

** 25% have anti A1 in serum⁶.

The Distribution of ABO blood groups is the best example of the heterogeneity & great variation among different races, colors, countries, continents & other geographical distributions of populations on the planet. This had been attributed to many factors like genetic or physiological differences, or because of the social character of the country. For example, in Caucasians & English population, the most common blood

group is the O, followed by the A, B & the least is the AB. This can differ greatly among others (Table II)^{2,16,18}. However, in Africans (black people), B is in general a much stronger antigen than in Europeans (white people)⁸ and black people have a higher level of B-specified glycosyl transferase in the serum¹⁹. Based on quantitative agglutination, about 50% of black people have stronger B than white people²⁰.

Table II: The distribution of ABO blood groups among some races and world regions¹⁸.

People Group	O	A	B	AB
Japan	17	32	32	18
Arabs	34	31	29	6
English	47	42	9	3
French	43	47	7	3
Hindus	32	29	28	11
Kikuyu (Kenya)	60	19	20	1
Peruvians	100	0	0	0
Swiss	40	50	7	3
Turkish	43	34	18	6
USA(blacks)	49	27	20	4
USA(white)	45	40	11	4

Aim of the study

Owing to that great variation in the distribution of ABO blood groups, this study had been conducted to know their distribution among the whole population of Basrah City & among its different districts.

Materials and methods

During a period of 14 months (Oct 2005 to Dec 2006), six hundred, & twenty (620) healthy, young adult volunteers from both sexes were taken from several places around the province of Basra City, including university students & blood donors attended the Central Blood Bank of Basra. Their gender, origin & residence were identified.

From each individual, 5 mls of blood were aspirated, collected in plain tubes to test on. Red cells were separated from serum by simple clotting &

centrifugation and then, they were washed up with isotonic saline while sera were collected out into separate test tubes. All samples were treated as follows: red cells (forward) grouping was done, by treating them with equal volumes of a panel of commercial anti A, anti B, anti A+B antisera, prepared AB serum(from AB blood group) & individuals, own sera, while the serum(backward) grouping was done by treating individuals, sera with a panel of known A,B, AB & O red blood cells. Each reactant was put in a Khan glass tube. All were kept for half an hour at room temperature, centrifuged for 5 minutes & then examined then after for the existence of agglutination both macro- & microscopically. (Knowles, 2001b). Results of both red cells & sera grouping were matched to obtain the ABO blood group for each (Table III).

Table III: ABO blood grouping schedule²¹.

Red Cell Grouping					Serum Grouping				
Anti-A serum	Anti-B serum	Anti-A+B serum	AB serum	Own serum	A cells	B cells	AB cells	O cells	Blood Group
+	-	+	-	-	-	+	+	-	A
-	+	+	-	-	+	-	+	-	B
+	+	+	-	-	-	-	-	-	AB
-	-	-	-	-	+	+	+	-	O

Results

The study showed a higher prevalence of blood group O among total individuals in Basrah governorate (42.6%), among both males (42.9%) & females (42.33%) and in all different regions of the of Basrah Governorate with slight variation from one region to another. It was highest in the Al-Mudaena (49.2%), while Al-Zubaer had the lowest frequency (39.1%). Blood groups A & B were next in frequency with nearly equal distribution among all (24.7% for A & 25% for B), & in both sexes (males 25.2% for A & 24% for B, females 24.2% for A & 26% for B). The regional distribution of both groups

showed a bit more variation. Blood group A was highest in prevalence in Al-Qurna (31%) & lowest in Abul-Khaseeb (16.1%) while blood group B showed the highest prevalence in Abul-Khaseeb (34%) & lowest in Al-Mudaena(13%).

Blood group AB formed the least in prevalence among total, males & females(7.58 &, 8.16 & 7.58% respectively). Its peak was in Al-Mudaena (11.48%) & least in Al-Faw (0 %). (tables IV & V).

Results did not show any significant difference between regional distribution & various blood groups at the level of $P < 0.05$.

Table IV: Distribution of the ABO blood groups in Basrah Governorate related to gender

Gender	Total		AB		A		B		O	
	N	%	N	%	n	%	N	%	n	%
Males	294	100	24	8.16	74	25.2	70	24	126	42.90
Female	326	100	23	7.58	79	24.2	86	26	138	42.33
Total	620	100	47	7.58	153	24.7	156	25	264	42.6

n: Number of samples

Table V: Distribution of the ABO blood groups among different districts of Basra Governorate

District	Total		AB		A		B		O	
	n	%	N	%	n	%	N	%	N	%
City center	259	100	20	7.72	65	25.1	68	26	106	40.9
Abul	62	100	6	9.67	10	16.1	21	34	25	40.3
Zubaer	87	100	8	9.19	17	19.5	28	32	34	39.1
Qurna	71	100	6	8.45	22	31	12	17	31	43.7
Mudiana	61	100	7	11.48	16	26.2	8	13	30	49.2
Fao	80	100	0	0	23	28.8	19	24	38	47.5
Total	620	100	47	7.58	153	24.7	156	25	264	42.6

Discussion

The distribution of ABO blood groups throughout the province of Basrah showed a highest prevalence of O blood group, followed by A and B nearly equally & the least was the AB blood group. The same distribution was seen among both genders with the exception that there was a slightly higher A than B frequency among males while there was

a slightly higher B frequency than A among females & & the AB group was slightly less than that of males.

These results agreed to some extent with the results of some of local, Arab, neighboring and international studies & differed from some others as well.

The study conducted by Fatihallah. (1987)²² on Basrah population, showed

that blood group O was the highest, among both genders, males & females (39.6%, 34.55% & 37.4% respectively), followed by the A (31.8%, 33.6% & 30% respectively), the B (25.1%, 24.1% & 26.2% respectively) while the AB was the least (7.1%, 7.8% & 6.45% respectively), while Khalaf study(1994)²³ in Basrah, too, have shown more comparative results to this study, where blood group O was the most common among both genders, males & females (39.7%, 38.2% & 37.5% respectively) and a nearly similar distribution of A and B (26.5% / 26.3%, 25.2% / 24.5% & 31.9% / 24.6% respectively) while the least was the AB group (7.5%, 12.1% & 6.0% respectively).

Furthermore, the registry reported by the Iraqi Ministry of Health on the distribution of ABO blood group among Iraqis during the period 2001-2005 among blood donors attended the National Center for Blood Transfusion & its Governorates, branches, showed comparable frequencies to this study where the O blood group was the most prevailing (35.8%), followed by the B and A blood (28.2% and 27.8% respectively), while the blood group AB was the least (8.2%) of the population²⁴.

To compare with nearby neighboring countries, Bashwari et al. (2001)²⁵ showed that the distribution of ABO blood groups among Saudi Arabian population was the same in order but with a difference in frequency: O, (51%), A (26.5%), B, (18%) and AB, (4.5%). However, it showed a higher blood group O frequency & lower blood group AB, while Boskabody et al. (2005)²⁶, showed a bit identical results among the population of Mashhad City in Iran to this study: O (44.7%) nearly equal B and A (23.3% and 23.1% respectively), and the last was the AB (8.9%). However, the picture is slightly different among males where the blood group O was the most common followed by A, B & AB but with a higher frequency of A than B

(36%, 32.3%, 21.35% & 10.3% respectively). Yet, the picture was more different among females where the blood group A was the most common, followed by O, B & AB (33.9%, 33.0%, 25.3% & 7.4% respectively). The distribution among Turkish population was also comparable to those of this study in the frequency of O, and AB blood groups: 43% and 6% respectively, while contradicted it in those of A and B blood groups: of 34% and 18% respectively.

Comparing with further countries, Khan et al(2004)²⁷ study among Pakistani population showed a greater difference than this, where the most common type among both genders, & males was the B (36.23%, 36.1% respectively), followed by the A (31.03%, 34.85% respectively), followed by the O (25.07%, 24.35% respectively) & the least type was the AB (7.67%, 4.85%). However the picture among Pakistani females was more or less nearer to this study: where the most common group was the O (36.4%) followed by equal distribution of both A & B (26.1% for each) & lastly the AB (11.4%).

The study conducted by Omatade et al. (1999)²⁸ on the Nigerian society showed a higher group O frequency (54.2%) with a nearly same distribution of both A and B blood groups (21.6% and 21.4%, respectively), while group AB, was 3.8%, while Guyton (2000)²⁹ registry of Caucasian origin in Britain, showed a different distribution where the O and A were 47% and 41% respectively, while B and AB were 9% and 3% respectively.

It has been noted (Garraty et al., 2004)³⁰ that the blood group O is the highest among whites and American Indians in North America (56.5% and 54.6% respectively). While Malekasgar (2004)³¹ study among Indians showed that the distribution of ABO groups among males was different than among females where, among males, blood group A was the highest, (36%), followed by the O (30.7%), the B (22.7%) and the AB

(10.7%), while among females blood group B was the most common (39.2% O, followed by the O, (30.4%), the A (26.6%) and finally the AB, (8.9%).

Conclusion

Blood group O is the predominant group among Basrah population, followed by nearly equal frequency of both A & B groups & AB was the least. Those

observations were more or less similar to other local, national registries as well as these registered in the neighboring countries while it was more different than other countries far from Iraq. This may stimulate another study to include racial, other ethnical factors (blacks vs. whites, Kurds vs. Arabs vs. Turks) to notice any difference in the frequency of ABO blood group among them.

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