

DISTRIBUTION OF BLOOD GROUPS AMONG POPULATION IN THE CITY OF MASHHAD (North East of Iran)

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ABSTRACT

Objective: To determine the percentage of ABO and Rhesus blood groups among population of the city of Mashhad.

Design: The blood groups of studied population was performed using routine method of blood grouping.

Subjects: Eight hundred sixty-seven subjects aged 8 Year and above including 436 male and 431 female. The subjects were randomly selected from 20 different areas of the city of Mashhad.

Results: The results showed that the percentage of blood groups A, B, AB and O among studied population was 23.1%, 23.3%, 8.9% and 34.7% respectively. 88.71% of studied population was rhesus positive and 11.3% rhesus negative.

Conclusion: This study revealed the percentage of different blood groups for the population of the city of Mashhad that was significantly different with those of several other studies.

KEY WORDS: Blood groups, ABO, Rh, Iranian population

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INTRODUCTION

The history of blood group antigens dates back to 1901 when Ladsteiner named the first 2 blood groups using the first 2 letters of the

English alphabet, Red Blood Cells (RBCs) not reacting with anti-A and anti-B were called C.¹ Von Decastell and Sturili in 1902 described RBCs not reacting with anti-A and anti-B but did not give this type a name. In 1911, Von Dungern and Hirszfled were the first to use the term O to describe RBCs not reacting with anti-A and anti-B and the term AB for RBCs reacting with both anti-A and anti-B.¹

The A,B, AB and O blood groups generally called ABO groups. The ABO blood groups are genetically determined by antigen present on the surface of RBCs and most other body cells. Phenotypically there are 4 groups namely A, B, AB and O determined by 3 allelic genes located near the tip of the long arm of chromosome 9.² The Rhesus(Rh) system was discovered in 1940 and there are two terminologies, the CcDdEe terms of Fisher and Race, Race and Sanger and the Rh/Hr terms used by Wiener and his co-workers regarding this system.^{1,3}

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The expression of the Rh factor is controlled by 2 closely linked genes; one gene codes for Dd and the other gene for Cc and Ee.^{3,4} Both ABO and Rh blood groups exhibit extensive polymorphism and frequency in different populations. There are evidences regarding differences in distribution of blood groups in different ethnics and geographic areas.⁵⁻¹⁰ There are many other blood groups system including MNSs, P, Lutheran, Kell Lewis, Duffy, Kidd, Diego, Yt, etc. Each of these blood groups involve two or more ally genes. However, these blood groups are of little importance in clinical practice and are used mostly in Genetic and forensic medicine.¹¹ As even the distribution of ABO blood groups in Iranian population is not well documented. Therefore, in the present study the distribution of ABO blood groups among population in the city of Mashhad (north east of Iran) was studied.

METHODS

Study area and population

The study area was the city of Mashhad, which has moderate industry and heavy traffic. Mashhad is a holy city located in the north-east of Iran with a population of 2 million people many of whom are immigrants from all over Iran. In addition there is little or no difference in ethnicity of the inhabitants of the different areas of Iran. Therefore the population of Mashhad could well be considered as representative of the Iranian population.

Subjects

Eight hundred sixty seven subjects aged 8 year and above including 436 male and 431 female participated in the study. Determination of blood groups were carried out in the homes of the subjects studied in 20 randomly selected areas of Mashhad. Therefore the studied subjects were of different socio-economic classes. The protocol was approved by the ethics committee of our institution and each subject gave informed consent.

Measurements

In each subject three drops of blood were taken from tip of the finger under sterile condition and put on three point of a white tile marked by letters A, B, and Rh. One drop of each antiserum A, B, and D were added to blood drop A, B, and Rh respectively and the blood drops mixed with each antiserum. The blood drop were examined for agglutination after 5 minutes. Agglutination in blood drop A was considered as group A and agglutination in blood drop B as group B. Agglutination in both blood drop was considered as group AB and if both blood drops were not agglutinated, blood group was considered as O. The agglutination in Rh blood drop was considered as RH positive and non-agglutination as RH negative. The study was performed between June and September 2002.

Data Analysis

Based on the distribution of blood groups of other studies, using the Per Protocol Sampling (PPS) sampling method, it was calculated that a maximum of 800 subjects would be needed to detect a 5% difference in the distribution of blood groups with an α error of 5% and a power of 80%. Twenty areas from all over the city were randomly selected, and about 20 subjects were studied in each area. All data were analysed using the Statistical Package for Social Science software. The distribution of different blood groups among male, female and total population were expressed as percentage. The distributions of different blood groups were compared between male and female using unpaired "t" test. In addition the distribution of blood groups obtained in the present study with those of several other studies¹²⁻¹⁶ were compared using ANOVA. The criterion of significance was $p < 0.05$.

RESULTS

Distribution of ABO blood groups

The percentage of A, B, AB and O blood

groups among studied male subjects were 32.3, 21.3, 10.3 and 36% respectively (Table-I). For studied female, the percentages of ABO blood groups were 33.9, 25.3, 7.4 and 33.4% for A, B, AB and O groups respectively (Table-I). There was no significant difference in distribution of ABO blood groups between male and female subjects. The distribution of A, B, AB and O groups among total studied population were 33.1, 23.3, 8.9, and 34.7% respectively (Table-I).

Distribution of Rh blood groups

The percentage of Rh positive and Rh negative blood groups among studied male subjects were 88.8 and 11.2% respectively (Table-II). For studied female, the percentage of Rh blood

groups was 88.6 and 11.4% for Rh positive and Rh negative groups respectively (Table-II). There was no significant difference in distribution of Rh blood groups between male and female subjects. The distribution of Rh positive and Rh negative groups among total studied population were 88.7 and 11.3% respectively (Table-II).

Comparison of distribution of different blood groups between the present and other studies

Distribution of the ABO and Rh blood groups obtained in the present study were significantly different with those of several other studies ($p < 0.05$ to $p < 0.001$ for ABO groups and $p < 0.05$ to $p < 0.01$ for Rh groups (Table III and IV).

Table-I: Distribution of different ABO blood groups among male, female and total studied population

Blood group	Male		Female		Total	
	Number	%	Number	%	Number	%
A	141	32.3	146	33.9	287	33.1
B	93	21.3	109	25.3	202	23.3
AB	45	10.3	32	7.4	77	8.9
O	157	36	144	33.4	301	34.7

There was no significant difference in distribution of ABO blood groups between male and female subjects.

Table-II: Distribution of different Rh blood groups among male, female and total studied population

Blood group	Male		Female		Total	
	Number	%	Number	%	Number	%
Rh Positive	387	88.8	382	88.6	769	88.7
Rh Negative	49	11.2	49	11.4	98	11.3

There was no significant difference in distribution of ABO blood groups between male and female subjects.

Table-III: Comparison of distribution of different ABO blood in the present study with those of other studies

<i>Study</i>	<i>A</i>	<i>B</i>	<i>AB</i>	<i>O</i>
Present	33.1	23.3	8.9	34.7
Caucasians (Guyton, 2000)	41 *	9 ***	3 **	47 **
Australia (Keller,1992)	38 *	10 **	3 **	49 **
England (Malison et al., 1993)	42 **	8 **	3 **	47 **
Western Europe (Race and Sanger,1975)	45 **	8 **	4 **	43 **
African (Race and Sanger, 1975)	29 *	17 **	4 **	50 **
Saudi Arabia (Bashawi et al., 2001)	26 *	18 *	4 **	51 **

Statistical difference between the results of the present and other studies;
NS: non-significant, *: p<0.05, **: p<0.01, ***: p<0.001

Table-IV: Comparison of distribution of different Rh blood in the present study with those of other studies

<i>Study</i>	<i>Rh Positive</i>	<i>Rh Negative</i>
Present	88.7	11.3
Caucasians (Guyton, 2000)	85 *	15 *
American Black (Guyton, 2000)	95 *	5 *
African Black (Guyton, 2000)	100 **	0 **
Black (Am Asso Bl Bank, 1996)	71 **	29 **
American (Am Asso Bl Bank, 1996)	86 *	14 *
White (Am Asso Bl Bank, 1996)	60 **	40 **
Asian (Am Asso Bl Bank, 1996)	95 *	5 *
Western Europe (Race and Sanger, 1975)	61 **	39 **
Oriental (Race and Sanger, 1975)	90 NS	10 NS
Saudi Arabia (Bashawi et al., 2001)	92 NS	8 NS

Am Asso Bl Bank: American Association of Blood Bank

DISCUSSION

In the present study the distribution of different blood groups was evaluated. For this purpose the blood groups of 867 subjects from 20 different areas were studied. The results of the present study showed the distribution of A, B, AB and O blood groups among population aged 8 year and over in the city of Mashhad were 33.1, 23.3, 8.9 and 34.7% respectively. There was no significant difference between male and female subjects in distribution of ABO blood groups. The results also showed that

88.7% of population of the city of Mashhad are Rh positive and 11.33% are Rh negative. The distribution of Rh blood groups between male and female subjects were also not statistically different.

Comparison of the distribution of ABO and Rh blood groups in population of the city of Mashhad obtained in the present study with those of several other studies¹²⁻¹⁶ showed significant difference in both ABO and Rh blood group of population of this region of Iran and those of several areas of the world including some areas of Asia. In addition the distribu-

tion of different blood groups in the present study was very similar to that of an only document regarding the distribution of blood groups in Iranian population.¹⁰ These findings confirm that the distribution of blood group in different areas of the world varies which is perhaps due to genetic differences between different populations. Therefore, it is necessary to determine blood groups of different ethnic and geographical areas to meet transfusion and forensic medicine needs.

CONCLUSION

The results of this study showed the distribution of ABO and Rh blood group, which was significantly different from those of several other areas of the world.

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