

Distribution of ABO and Rh blood groups in a major ethnic group of the West Iran, the Kurdish population

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ABSTRACT

Introduction: ABO and Rh are the most important blood group systems with various distributions reported for different populations. There are no reports referring to the distribution of the ABO/Rh blood groups in Iranian Kurdish population. Therefore, the aim of this study was to determine the frequency of these blood groups among this major Iranian ethnic group from Ilam city. **Materials and Methods:** 1,534 blood donors attending the blood transfusion service in Ilam, Iran, were randomly selected over a period of six months. The ABO/Rh blood groups were determined by the forward and reverse grouping. **Results:** The most frequent blood group in men and women was A and O; respectively, followed by B and AB. In the Rh system, 91.1% of the donors were positive and 8.9% were negative. **Conclusion:** This study provided new insight into distribution of the ABO/Rh blood groups in a major ethnic population of west Iran. Moreover, the presented data may also be useful in health care planning, population genetic studies, genetic counseling and medical diagnosis.

Key words: ABO blood group, Rh blood group, Kurdish population

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INTRODUCTION

ABO is the most important blood group system. It was discovered by Landsteiner in 1900, and was later followed by the discovery of the rhesus system: The second most important blood group system. The determination of blood groups is based on antigenic substances which are inherited on the surface of red blood cells.¹ In this regard, these groups are classified into four types: A, B, AB and O in the ABO system and Rh-positive and Rh-negative using the rhesus system.² A wide range of studies have been conducted to determine the frequency of ABO and Rh phenotypes in different populations. Although ABO/Rh blood groups are determined at conception and remain throughout life, diverging phenotypic results have been obtained across various ethnic populations in different geographical boundaries.³⁻⁷ In addition to the importance of these blood groups in blood transfusion, their usefulness in population genetic studies, population migration patterns, forensics and disputed paternity cases is well established.^{8,9} Moreover, there are several reports in which some associations have

been found for diseases between the ABO and Rh blood group systems.¹⁰⁻¹³ These findings emphasize the hypothesis that individuals of different blood types have considerable physiological differences.¹⁴ However, in some cases, no clear explanation for such an association has been provided.² In addition, blood group antigens may be a genetic marker for certain diseases. For instance, because of the role of the ABO blood group A1 in increasing serum cholesterol and blood pressure, this blood group antigen has been suggested as a genetic marker for raising the risk of coronary heart disease.¹⁵ Nevertheless, there is no report on the distribution of the ABO blood group in the Kurdish population of the west Iran. Thus, the present study was carried out to assess the distribution of the ABO and Rh blood groups among the major ethnic population in this area, the Kurds.

MATERIALS AND METHODS

This study was carried out on 1534 blood donors who were attending Ilam blood transfusion service during a period of six months from March to August 2011, to

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determine the distribution of the ABO and Rh blood groups. The study group consisted of 1424 males (92.8 %) and 110 females (7.2%) who were of Iranian Kurdish origin from Ilam city. The mean age was 36.7 ± 9.8 . All participants were selected and examined for their ABO/Rh status. Informed consent was granted prior to the sample collection.

The blood samples were collected by cubital venepuncture and emptied into tubes containing EDTA as an anticoagulant. In order to determine the ABO and rhesus blood groups, forward and reverse grouping by means of the standard test tube methods took place.¹⁶ In doubtful cases, the prepared samples were observed microscopically. In the case of the Rh negative result, the indirect antiglobulin test (IAT) was performed to confirm the weak D. Finally, the results were reported in simple percentages.

RESULTS

The prevalence of ABO and Rh blood groups in the total of 1,534 males and females was determined. As can be seen from Table 1, in men and women the most frequent ABO blood groups were A (37.8%) and O (40.9%), respectively, whilst the least frequent one was AB. According to the Rh system, 91.1% and 8.9% of the participants were respectively positive and negative, amongst whom blood group A⁺ was found to be the most common (34.2%), followed by groups O⁺ (33.7%), B⁺ (16.2%) and AB⁺ (7%), whereas amongst the Rh negative subjects, blood group O was the most frequent (3.5%), followed by groups A⁻ (3%), B⁻ (1.6%) and AB⁻ (0.8%), as shown in Table 2.

Table 1: ABO blood group distribution in men and women

Sex	Prevalence	Blood group				Total
		A	B	AB	O	
Male	No.	538	255	106	525	1424
	%	37.8	17.9	7.4	36.9	100
Female	No.	33	19	13	45	110
	%	30	17.3	11.8	40.9	100

Table 2: ABO/Rh blood groups frequencies in the study population

Blood group	%	No. of individuals
A ⁺	34.2	525
B ⁺	16.2	249
AB ⁺	7.0	107
O ⁺	33.7	517
A ⁻	3.0	46
B ⁻	1.6	25
AB ⁻	0.80	12
O ⁻	3.5	53
Total	100.0	1534

DISCUSSION

Due to its medical importance in relation to different diseases, pursuing a line of investigation on the ABO and Rh blood group systems has been of significance for years. It is well known that these blood group systems is of great importance in blood transfusion and organ transplantation.⁶ Furthermore, the susceptibility to several diseases has been associated with the ABO phenotype, but such correlation remains controversial.^{11,17}

There are different reports on the distribution of the ABO blood group in various geographical, ethnic and socio-economic groups.¹⁸ In spite of these diverse results, blood group O has been reported to be the most common blood group in most of the studies, whilst the least frequent was blood group AB.^{1,3,19-25} However, in two studies on Nepalese medical students and on a population of the Russian Federation, A was the most prevalent blood group.^{3,26}

In this study the blood group A had the highest incidence in the male subjects (37.8%) followed by groups O (36.9%), B (17.9%) and AB (7.4%). In female subjects, in contrast, the blood group O (40.9%) was the most prevalent followed by groups A (30%), B (17.3%) and AB (11.8%); this may be due to the fact that there was a noticeable difference between the number of samples in both groups. However, the frequencies among the population were in the order of $O \approx A > B > AB$.

The findings from this study are in accordance with the aforementioned studies that also reported AB as the least prevalent blood group.^{1,3,19-24} The results are also in agreement with those of a nation-wide Iranian study in which the distribution of major blood groups among 1,300,000 blood donors in different provinces in the year 2001 was compared to that of the year 1982.²⁷ The present study confirmed that the frequency of the ABO blood group in Ilam city remained almost stable over the next 11 years. Both studies revealed that the frequency of blood group O has increased since 1982, whereas the frequency of blood group B has diminished and there were no remarkable differences in the frequencies of blood groups A and AB (Table 3). Although the sample size of this study was much less than the mentioned study, the investigation of just a major ethnic group was the upside of the current study.

The distribution pattern of blood groups O and A is inconsistent with that of Hameed et al. who reported blood group B as the most prominent one in Pakistan.⁸ Similarly, Bikash Mondal et al. showed that the frequency of the B gene was higher than that of the A gene.⁹ Such contradictions are probably due to immensely different

Table 3: Comparison of the ABO blood groups prevalence in Ilam city among 1982, 2001 and 2012

Blood group	A	B	AB	O
1982	37.26	23.57	6.84	32.32
2001	36.35	18.47	7.00	36.52
Present study	37.22	17.86	7.75	37.15

sample sizes, geographical environments and ethnic groups in the study populations. Moreover, it shows that specific ABO blood groups might be distributed in different regions of the world.

In the Rhesus System, the prevalence of Rh positive was 91.1% compared to only 8.9% for Rh negative. A similar pattern of the distribution is also found in another Iranian study in which the Rh positive and Rh negative frequencies were 90.45% (2001)/91.63% (1982) and 9.54% (2001)/8.37% (1982); respectively.²⁷ The prevalence of Rh positive (90%) and Rh negative (10%) in the neighbouring city of Ilam, Ahwaz, was also very similar to the current study.²⁸ Keramati *et al.* reported the ABO frequency in the northeast of Iran in the order of O>A>B>AB,²⁹ while it was determined as O=A>B>AB in the Nojavan *et al.* survey;³⁰ both of the works were in agreement with the results of this study.

As with the ABO blood group system, different reports are represented in the other regions of the world. For instance, in West Bengal, India, the prevalence was 97.7% and only 2.3% for Rh positive and Rh negative, respectively.⁹ In addition, 29% of the population in Al-Jouf Province, Saudi Arabia, were Rh negative.¹⁹ In comparison, the Rh negativity in the present study is about 20% lower than that of Saudi Arabia and higher than that of India (about 7%). Therefore, the expected occurrence of Rh iso-immunization would be lower than that of Al-Jouf province and higher than that of West Bengal, India. On one hand, it was also revealed in the present study that A⁺ (34.2%) had a higher prevalence compared to other blood groups. On the other hand, the least frequent blood type was AB⁻ (0.8%).

The determination of the distribution of the ABO/Rh blood groups among any population of different ethnic groups would be a high valuable approach by which better health care planning, counselling of the targeted population and medical diagnosis would be provided. It is also vital in the prevention and reduction of the haemolytic disease of the newborn (HDN) which is related to the ABO/Rh mismatches.^{5,8,9} Nonetheless, a larger study is necessary for better determination. Moreover, a study on the association of ABO/Rh blood groups and certain diseases in this ethnic population is highly recommended.

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REFERENCES

- Kondam A and Chandrashekar M. A study of "incidence of hypertension in abo and rhesus blood group system. *Int J Biol Med Res* 2012;3(1):1426-1429.
- Nishi K, Gupta NK and Sharma SC. Study on the Incidence of Hypertension and Migraine in ABO Blood Groups. *ISCA Journal of Biological Sciences* 2012; 1(2):12-16.
- Pramanik T and Pramanik S. Distribution of ABO and Rh blood groups in Nepalese medical students: A report. *Eastern Mediterr Health J* 2000;6(1):156-158.
- Adeyemo O and Soboyejo O. Frequency distribution of ABO, RH blood groups and blood genotypes among the cell biology and genetics students of University of Lagos, Nigeria. *African Journal of Biotechnology* 2006; 5(22) :2062-2065.
- Akinnuga A, Bamidele O, Amosu A and Ugwa UG. Distribution of ABO and Rh Blood Groups among Major Ethnic Groups of Medical Students of Madonna University Teaching Hospital, Elele, Nigeria. *Asian Journal of Medical Sciences* 2011; 3(3):106-109.
- Chandra T and Gupta A. Association and Distribution of Hypertension, Obesity and ABO Blood groups in Blood Donors. *Iranian journal of Pediatric Hematology Oncology* 2012;2(4):140-145.
- Abdollahi A, Qorbani M, Salehi A and Mansourian M. ABO blood groups distribution and cardiovascular major risk factors in healthy population. *Iranian Journal of Public Health* 2009; 38(3):123-126.
- Pennap G, Envoh E and Igbawua I. Frequency Distribution of Hemoglobin Variants, ABO and Rhesus Blood Groups among Students of African Descent. *British Microbiology Research Journal* 2011;1(2):33-40.
- Mondal B, Maiti S, Biswas BK, Ghosh D and Paul S. Prevalence of hemoglobinopathy, ABO and rhesus blood groups in rural areas of West Bengal, India. *Journal of Research in Medical Sciences* 2012;17(8):772-776.
- Wu O, Bayoumi N, Vickers M and Clark P. ABO (H) blood groups and vascular disease: A systematic review and meta-analysis. *Journal of Thrombosis and Haemostasis* 2008;6(1):62-69.
- Anstee DJ. The relationship between blood groups and disease. *Blood* 2010;115(23):4635-4643.
- Whincup P, Cook D, Phillips A and Shaper A. ABO blood group and ischaemic heart disease in British men. *BMJ: British Medical Journal* 1990;300(6741):1679.
- Binder H, Flegel W, Emran J, Müller A, Dittrich R, Beckmann M, *et al.* Association of blood group A with early-onset ovarian hyperstimulation syndrome. *Transfusion clinique et biologique* 2008;15(6):395-401.
- Miller JZ, Grim CE, Conneally P and Weinberger MH. Association of blood groups with essential and secondary hypertension. A possible association of the MNS system. *Hypertension* 1979;1(5):493-497.
- Gillum RF. Blood groups, serum cholesterol, serum uric acid, blood pressure, and obesity in adolescents. *Journal of the National Medical Association* 1991;83(8):682.
- Brecher ME CM, Goodnough LT, Grossman BJ, Harris T, Heddle N, *et al.* The technical manual of the American Association of Blood Banks. 14 ed: Bethesda, Maryland; 2002. 669-670p.

17. Jassim W. Association of ABO blood group in Iraqis with hypercholesterolaemia, hypertension and diabetes mellitus. *EMHJ* 2012;18(8):888-889.
18. Beardmore J and Karimi-Booshehri F. ABO genes are differentially distributed in socio-economic groups in England. *Nature* 1983;303:522-524.
19. Eweidah MH, Rahiman S, Ali MH and Al-Shamary AMD. Distribution of ABO and Rhesus (RHD) Blood Groups in Al-Jouf Province of the Saudi Arabia. *Anthropologist* 2011;13(2):99-102.
20. Bashwari LA, Al-Mulhim AA, Ahmad MS and Ahmed MA. Frequency of ABO blood groups in the Eastern region of Saudi Arabia. *Saudi Med J* 2001;22(11):1008-1012.
21. Das P, Nair S, Harris V, Rose D, Mammen J, Bose Y, et al. Distribution of ABO and Rh-D blood groups among blood donors in a tertiary care centre in South India. *Tropical doctor* 2001; 31(1):47-48.
22. Gill JC, Endres-Brooks J, Bauer PJ, Marks WJ and Montgomery RR. The effect of ABO blood group on the diagnosis of von Willebrand disease. *Blood* 1987; 69(6):1691-1695.
23. Al-Bustan S, El-Zawahri M, Al-Azmi D and Al-Bashir A-A. Allele frequencies and molecular genotyping of the ABO blood group system in a Kuwaiti population. *International journal of hematology* 2002;75(2):147-153.
24. Ali-Shtayeh M, Hamdan A and Faydi YR. Distribution of ABO blood groups and the Rh factor in Palestinians living in the northern part of the West Bank. *An-Najah University Journal for Research* 1988;5:35-41.
25. Hamed C, Bollahi M, Abdelhamid I, Mahmoud M, Ba B, Ghaber S, et al. Frequencies and ethnic distribution of ABO and Rh (D) blood groups in Mauritania: Results of first nationwide study. *International journal of immunogenetics* 2012;39(2):151-154.
26. Tomilin V and Gurtovaia S. The incidence of finding ABO system antigens in the population of the Russian Federation. *Sudebno-meditsinskaia ekspertiza* 1999;42(3):16.
27. Pourfath EA, Oody A and Honarkaran N. Geographical distribution of ABO and Rh (D) blood groups among Iranian blood donors in the year 1361 (1982) as compared with that of the year 1380 (2001). *Blood (Khoon)* 2004;1(1):11-17.
28. Marzban M, Kamali M and Hosseinbasi T. Blood groups of the people of Ahwaz, Iran. *Anthropologischer Anzeiger* 1988: 83-89.
29. Keramati MR, Shakibaei H, Kheiyami MI, Ayatollahi H, Badiei Z, Samavati M, et al. Blood group antigens frequencies in the northeast of Iran. *Transfusion and apheresis science* 2011;45(2):133-136.
30. Nojavan M, Shamsasenjan K, Movassaghpour AA, Akbarzadehlaleh P, Torabi SE and Ghojzadeh M. Allelic prevalence of ABO blood group genes in Iranian Azari population. *BiolImpacts* 2012;2(4):207-212.

Authors Contribution:

ZG – Concept, literature search, contribution during experiment, data and sample collection and laboratory work; **KS** – Concept, design of the study, Statistical Analysis; **MZ** – Contribution during experiment and participated in the data and sample collection; **SMS** – concept, design of the study, literature search and manuscript preparation.

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