

## Gene frequencies of ABO and rhesus blood groups in Sabians (Mandaeans), Iraq

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### Abstract:

The present study aimed to determine the frequency of ABO and Rh blood group antigens among Sabians (Mandaeans) population. This paper document the frequency of ABO and Rh blood groups among the Sabians (Mandaeans) population of Iraq. There is no data available on the ABO/Rh (D) frequencies in the Sabians (Mandaeans) population. Total 341 samples analyzed; phenotype O blood type has the highest frequency 49.9%, followed by A 28.7%, and B 13.8% whereas the lowest prevalent blood group was AB 7.6%. The overall phenotypic frequencies of ABO blood groups were O>A>B>AB. The allelic frequencies of O, A, and B alleles were 0.687, 0.2 and 0.1122 respectively.

Rhesus study showed that with a percentage of 96.2% Rh (D) positive is by far the most prevalent, while Rh (d) negative is present only in 3.8% of the total population. The Sabians (Mandaeans) ethnic group showed the same distribution of ABO and Rh blood groups with others ethnic groups in Iraqi population.

**Key words:** Gene, ABO, rhesus blood groups, Sabians, Gene frequencies

### Introduction:

We are very thankful to Shakoori Farhan dakhel and Nisreen Iehad Badri for their support and guidelines in collection of blood samples; and their concerns in the overall publication of this article .

Genetic studies on the Iraqi people are limited and generally restricted to analysis of classical markers due to Iraq's modern political instability, Commonly quoted ABO/Rh(D) frequencies in Iraq are usually from relatively small studies with racial or ethnic categories .In the present paper, we studied the distribution of ABO and Rh blood group among the Sabians (Mandaeans) population of Iraq, According to most scholars, Mandaeans migrated from the Southern Levant to Mesopotamia in the first centuries CE and are certainly

of pre-Arab and pre-Islamic origin. They are Semites and speak a dialect of Eastern Aramaic known as Mandaic. Aramaic speaking indigenous pre-Arab and pre-Islamic inhabitants of southern Iraq (1). Most Iraqi Mandaeans live near waterways because of the practice of total immersion (or baptism) in flowing water every Sunday. Blood groups and other biochemical markers are genetically controlled traits that are suitable for studying population variation, as they are not subjected to environmental influence (2), all human populations share the same blood systems, although they differ in the frequencies of specific types. Genetic variation among individuals within a population can be identified at a variety of levels. It is possible to identify genetic variation from

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observations of phenotypic variation, The ABO and Rh blood groups varies worldwide and are not found in equal numbers even among ethnic groups ( 3 ) .Many different blood group antigens are found on the surface of red blood cells (RBCs) in every individual, Blood group typing is the process of testing red blood cells to determine which antigens are present and which are absent. Up till now about 400 red cells antigen has been identified, the majority are inherited by Mendelian fashion (4).

Globally, group O had the highest frequency (49.10%) ed in the following order: O in 37.62%, A in 30.25%, B in 24 followed by A (28.28%), B (18.56%) and AB (4.05%) ( 5).

Prospective epidemiologic studies aid in identifying genetic variants associated with diseases, health risks, and physiologic traits(6) . These genetic variants may eventually be measured clinically for purposes of diagnosis, prognosis, and treatment. There is thus a need to begin to develop consensus on whether and when genetic findings should be reported to participants in research studies.

### Material and methods:

**Subjects:** All subjects were of known Sabians (Mandaeans) Ethnicity tribes from different of Iraq; who were identified by their religion, they were from the different part of Iraq. The subjects were informed of the goal of the study and agreed to participate. A total of 341 apparently healthy subjects; 178 were men, and 163 were women, were included and were tested for ABO and Rh blood group.

*Collection of blood samples:* The blood samples were collected by fingerpicks with a sterile lancet. Each drop of blood was placed on a slide containing a drop of each of the antisera, anti A, anti B and anti D (The

*following monoclonal antibodies were used: SPINREACT Anti-A, Anti-B and Anti-A+B monoclonal of Citra Santa Coloma (Spain) for the ABO blood type; SPINREACT Anti-D of Citra Santa Coloma (Spain) for the Rh Group from Blood Research and Fractionation Co) was added and mixed with each blood sample. Agglutination of the blood drop with the three test sera was then assessed by gently probing through the mixture using a lancet. Blood drops exhibiting a clotting reaction with the test sera were considered positive for that particular blood grouping reagent. Each reaction was recorded and subjected to pooling and statistical analysis.*

**Statistical Analysis :** Preliminary estimates were calculated manually as Percentage & proportions for each variable. And we use S2 ABO estimator by Silva Square is a program to estimate the allele frequencies of the ABO blood group system, and perform a couple of statistical tests on the data, particularly to compare simple heuristic estimates of the allele frequencies, to show the EM algorithm in action, to obtain maximum likelihood (ML) estimates of the allele frequencies and to perform goodness-of-fit tests of the Hardy-Weinberg assumption.

We calculated the allele frequencies (p, q, and r) for the ABO locus for population, we obtained the adjusted estimates of the allele frequencies. Also, to check the significant deviation of the studied populations from Hardy-Weinberg equilibrium, we performed a test of goodness-of-fit (chi-square test) based on allele frequencies.

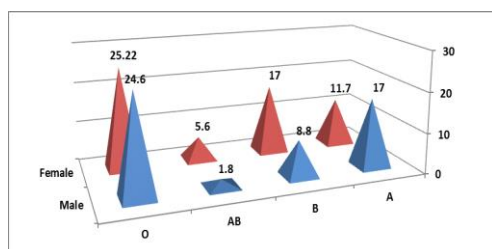
### Results:

The frequency distribution of phenotypes and alleles of ABO and Rh blood group systems among the

Sabians are given in table 1,2and 3 respectively, figure 1and 2.

**Table (1) Percentage distribution of ABO blood group by gender in Sabians (Mandaeans) population/ Iraq**

	A phenotype	B phenotype	AB phenotype	O phenotype
Male	17%(58)	8.8%(30)	1.8%(6)	24.6%(84)
Female	11.7%(40)	5%(17)	5.6%(20)	25.22%(86)
Total	(28.7%)98	(13.8%)47	(7.6%) 26	(49.9%)170

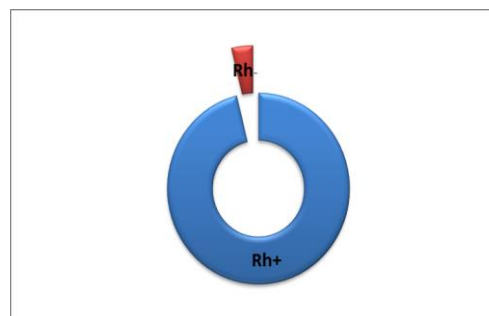


**Fig(1) Percentage distribution of ABO blood group by gender in Sabians (Mandaeans) population/ Iraq**

It has been observed that the frequency of O blood group is highest in Sabians population with percentage frequency of 49.9%, it is followed by A blood group with percentage frequency of 28.7%, B blood group with percentage 13.8% respectively, and AB blood group is found with the least percentage frequency 7.6% table(1) and figure(1).The difference in the pattern of blood groups O, A, B, and AB in men and women was inconsequential table (3).

**Table (2) Distribution of the Rh blood groups among Sabians (Mandaeans) population**

Rh group	No. (%)
Rh <sup>+</sup>	96.2%(328)
Rh <sup>-</sup>	3.8%(13)
Total	(100%)341



**Fig(2) Distribution of the Rh blood groups among Sabians (Mandaeans) population**

The frequency of Rh blood groups 96.2% and 3.8% positive and negative respectively table(2) and figure(2).

**Table (3) Prevalence of the phenotype of ABO and Rh (D) in studied by gender population in Sabians (Mandaeans) /Iraq**

Blood groups	Male	Female	Total (%)
A <sup>+</sup> (%)	57(17)	38(11.1)	95(27.9)
A <sup>-</sup> (%)	1(0.3)	2(0.6)	3(0.9)
B <sup>+</sup> (%)	26(7.6)	16(4.7)	42(12.3)
B <sup>-</sup> (%)	4(1.2)	1(0.3)	5(1.5)
AB <sup>+</sup> (%)	6(1.8)	20(5.9)	26(7.6)
AB (%)	0(0)	0(0)	0(0)
O <sup>+</sup> (%)	83(24.3)	82(24.1)	165(48.4)
O <sup>-</sup> (%)	1(0.3)	4(1.2)	5(1.5)
Total (%)	178(52.2)	163(47.8)	341(100)

Out of 341 subjects 178 (52.2%) were male subjects and 163 (47.8%) were female. Out of 178 male subjects 172 (50.44%) and out of 163 female subjects 156 (45.57%) were found to be Rh-positive. The frequency of Rh-negative group in male subjects were (1.76%) where as in female subjects were (2.1%). The frequency of A, B, O and AB groups in Rh-positive male subjects were 17%, 7.6%, 24.3% and 1.8%, amongst female subjects, it was 11.1%, 4.7%, 24.1% and 5.9% respectively. In Rh-negative male subjects the frequency of A, B, O and AB is 0.3%, 1.2%, 0.3% and 0%, while amongst females it is 0.6%, 0.3%, 1.2% and 0% respectively table (3).

**Table (4) Distribution of the ABO blood group among Sabians (Mandaeans) population**

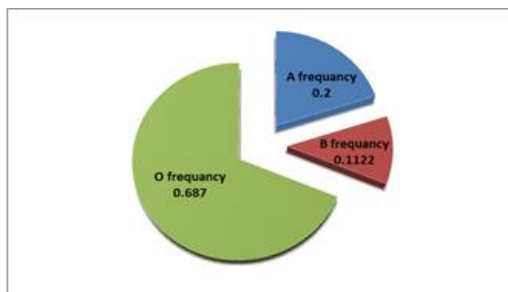
Prevalence of the ABO blood group in Baghdad					
Blood group	A (%)	B (%)	AB (%)	O (%)	Total (%)
Observed No.	98(28.7)	47(13.8)	26(7.6)	170(35.5)	341(100)
Expected No.	107.48	56.94	15.31	161.27	341
X <sup>2</sup> test	0.836	1.734	7.456	0.473	10.499
Pearson's x2 test=10.4994 df=1 P value=0.0012 df=3 P value=0.0147					

The X<sup>2</sup> value in table (4) indicates that the Sabians population of Iraq is in Hardy-Weinberg equilibrium, because the differences between observed and expected frequencies show statistically significant differences, so the expected under the Hardy Weinberg equilibrium (Goodness-of-fit X<sup>2</sup>= 10.4994, df=1, P<0.05) of ABO blood groups.

In addition, the chi-square test (with 3 degree of freedom) based on allele frequencies showed no significant deviation for studied population (10.499).

**Table (5) Allele Frequency (p, q, r) Variation at the ABO Locus among Sabians (Mandaeans) population**

Allele frequency of the ABO blood groups				
Allele frequency	p(A)	q(B)	r(O)	Total
Allele frequency	0.2	0.1122	0.687	0.9992
Stander Deviation	0.0162	0.01245	0.01879	
Hardy-Weinberg Log Likelihood=-405.2540 Test statistic=9.3241 P-value=0.0023				



**Fig(5) Allele Frequency (p, q, r) Variation at the ABO Locus among Sabians (Mandaeans) population**

The overall allelic frequencies were 0.687, 0.2 and 0.1122 for O, A and B alleles, respectively. The Hardy-Weinberg Law says that at equilibrium,  $(p + q + r)^2 = p^2 + q^2 + r^2 + 2pq + 2rp + 2qr = 1$ , so as shows in table (5) the allele frequency's to be in Hardy-Weinberg equilibrium =0.9992 nearly to one. However, verification by allelic frequencies for the blood types cannot be carried out, as it is not known whether blood types A and B are homozygous or heterozygous.

**Discussion:**

The genetic studies hard-earned scientific knowledge is generally ignored in most countries because of more demanding social and political concerns. Ever since the discovery of ABO blood groups by Landsteiner and his pupils, comprehensive works have accumulated in literature on the relation of ABO blood groups to anthropological and genetical applications, on its use in medico-legal identification and disputed paternity and also on its relationship to various diseases.

Blood group would be possible to divide up humanity into radically different groupings using blood typing instead of other genetically inherited traits such as skin color; we have more conclusive evidence that the commonly used typological model for understanding human variation is scientifically unsound. Our study population was concentrated around Sabians of Iraq.

The allele frequency's to be in Hardy-Weinberg equilibrium =0.9992 nearly to one table(5), This finding is agreement with the studies done by Abdullah 1976, Bakare et al 2006, When a population is in Hardy-Weinberg equilibrium for a given genetic locus it means that there is random mating (with respect to that locus), no selection, no mutation, no

gene flow and a population large enough to avoid the random effects of genetic drift, Therefore, the result of distribution of ABO system of this study followed the genetic segregation , so the studied populations are in genetic equilibrium and maintaining their own gene pools.

Populations geneticists generally use population genetic profiles to determine how reproductively isolated populations are from one another, and these frequencies remain constant in successive generations.

In the world we see variable distribution of blood groups in different geographical areas. Thus blood group O is more prevalent in Arab's Kuwaiti, Saudi, Bahraini, Libyan, and in other population like Iranian, Mauritanian, Nigerian, Indian while in countries like Lebanonian, Syrian , Jordanian ,Turkish population blood group A was more commonly seen (Table6). In Iraq the blood group O is most prevalent in Kurdish, Basrahian, Baghdadi populations. Moreover, this study further confirmed O blood group has the highest percentage frequency while AB has the

lowest percentage frequency as observed.

And all most studies in table (6) have shown that blood group O was the most common blood group and blood group AB was the least common blood group in different ethnic groups table (6) and the second frequency distribution of blood group was A This finding in agreement with Iraqi studies Jaff 2010, Abdullah 1976, Arabs study Sarhan et al 2009 but The results of Nofal' & Sakharov 1996 , Hanania et al 2007, Kayiran et al 2012 are different with the result of present study. The frequency of A, B, and O blood groups in the most studies of table (6) were similar to this study.

As shown in Table 6, frequencies of common Rh antigens are like the frequencies reported in world populations, they were nearly the same as data obtained from Iraqi, Turkish, Asian, African and populations of Arab Gulf in general populations (Jaff 2010, Abdullah 1976, Kayiran et al 2012, Rai and Kumar 2011, Hamed et al 2012, Sarhan et al 2009, Al-Arrayed et al 2001)table (6).

**Table (6) Comparison of Percentage (%) of ABO and Rh Blood Groups in different countries of the world and in different areas of Iraq**

Populations	A %	B %	AB %	O %	Rh %	reference
Iraqi population/Sabian	28.7	13.8	7.6	35.5	96.2	Present study
Iraqi population/ Arab Baghdadi	27.5	28.5	8.6	35.5	90.33	Al-ubadi 2013
Thi-Qar population	28.23	27.33	9.49	34.95	93.92	Mahmood et al 2013
Kurd/ population	32.47	23.84	6.53	37.16	91.73	Jaff 2010
Basrah/Iraqi population	27.8	29.1	6.3	36.8	91.8	Abdullah 1976
Syrian Arabs population	46.25	13.13	3.12	37.5	ND	Nofal' & Sakharov 1996
Jordanian population	38.36	18.04	6.98	36.62	ND	Hanania et al 2007
Kuwaiti population	26.7	24.1	4.6	44.6	ND	Al-Bustan et al 2002
Bahraini population	20.1	23.1	3.44	53.4	92.82	Al-Arrayed et al 2001
Southwest Saudi Arabian Population	33.4	6	3.8	56.8	92.8	Sarhan et al 2009
Iranian Azari Population	33.4	23.5	10	33.1	N.D	Nojavan etal 2012
Iranian north population	29.5	28.7	7.9	33.9	90.2	Keramati et al 2011
Turkish population/Istanbul	43.4	15.95	7.3	33.26	89.6	Kayiran et al 2012
Kunbis Population(India)	27.02	33.06	8.33	31.04	4.26	Warghat etal 2011
Asians Indian population	28.38	31.89	8.72	30.99	95.36	Purushottam et al 2011
Asians Uttar Pradesh, India	23.66	36.81	6.85	32.68	95.59	Rai and Kumar 2011
African Mauritanian population	28.28	18.56	4.05	49.10	94.23	Hamed et al 2012
African Nigerian population	26.9	16.1	4.2	52.9	91.7	Akinnuga et al2011
African Libyan population	33.1	12.8	5.2	48.9	87.2	Fayrouz et al 2012
African Nigerian population	22.9	21.3	5.9	50	96.7	Bakare etal2006
Europeans/Irish population	29.1	10.8	2.8	57.3	N.D	TILLS et al 1977

### Conclusion:

The data generated of a simple database of blood groups, to provide data serves to enable insight into possibilities of future burden of diseases. it is the first comprehensive study that documented the distribution of ABO and RhD blood groups in Sabians the data that are generated in this study would be helpful to researchers in the field of population genetics to explore the factors responsible for the observed distribution patterns of the genetic markers and the similarities among Sabians and other population in this are maybe refer to the historical relationship among them furthermore they may belongs to the same ancestor at the same time Sabians lived in different area during their history so that their gene distribution is diversified. This study further confirms that Blood group O RhD (+) was the most common and blood group AB RhD(-) was the least common among Sabians. Survey of blood groups and RhD types in Sabians showed similar frequencies to Arab population.

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## دراسة توزيع مجاميع الدم ABO ومعامل Rh لعينة عشوائية من طائفة الصابئة المندائيين

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### الخلاصة:

تهدف الدراسة الحالية الى معرفة توزيع مجاميع الدم ABO ومعامل Rh لعينة عشوائية للمجموعة العرقية المندائية الصابئية و توثق الدراسة الحالية توزيع مجاميع الدم ABO ومعامل Rh لعينة عشوائية للمجموعة العرقية المندائية الصابئية في بغداد و الإستفادة منها في دراسة وراثية العشائر. حيث أن ليس هناك دراسات وراثية (بيانات) متوفرة حول الطائفة المندائية الصابئية وتم تحديد مجاميع الدم لـ 341 فرد. أظهرت النتائج أعلى تكرار مظهري كان ضمن مجموعة مجموعة الـ O حيث كان تردد المظهري يساوي 49.9% هي الأكثر شيوعا بين مجاميع الدم في مجتمع الدراسة و يليه مجموعة الـ A كانت 28.7% ومجموعة الـ B 13.8 ومن ثم مجموعة الـ AB كانت الأقل تكرارا تساوي 7.6%. وكان التردد المظهري العام لمجاميع الدم ABO كانت  $O > A > B > AB$ . فكان التردد الأليلي للأليلات الـ O, A, B كانت 0.687, 0.2 و 0.1122 على التوالي. وأظهرت الدراسة أن تردد معامل الريصي الموجب 96.2% والسالب كان 3.8%. أظهرت هذه الدراسة بأن المجموعة العرقية الصابئية المندائية مشابهين في التردد الأليلي لمجاميع الدم ABO ومعامل Rh.