



Journal of Medical and Life Science
<https://jmls.journals.ekb.eg/>

Prevalence of ABO and Rh blood groups in Alexandria city, Egypt

Ahmed Abdelhalim Yameny

Society of Pathological Biochemistry and Hematology, Egypt.

Corresponding author: Ahmed A. Yameny. Email: dr.ahmedyameny@yahoo.com

Tel: (002)01002112248, ORCID number: <https://orcid.org/0000-0002-0194-9010>

DOI:10.21608/jmls.2021.420618

Abstract:

Background: Red blood cells (RBCs) or erythrocytes are differentiated from each other based on their surface antigen structures. It was Karl Landsteiner who first discovered the ABO blood group (BG) system in 1900 and rhesus (Rh) BG later, however, the ABO and Rh BG system have fundamental importance in blood transfusions. Therefore, a suitable cross-matching test between the intended donor and the patient is highly recommended and is a part of routine clinical analysis. **Methods:** The data was obtained from data records of Alyameny laboratory files in Alexandria city, Egypt, the Blood groups and Rh results for 5928 patients were collected from data records in 19 years (2002- 2020), in Al-Raml district the residence of this district coming from most Egyptian governorates from Alexandria to Aswan, so this study near to be about Prevalence of ABO and Rh blood groups in Egypt with limitation in the number of participants is only 5928.

Results: This study showed that blood group A had the highest frequency (32.4%), and the frequency of O, B, and AB blood groups was 31.8%, 25.3%, and 10.5%, respectively. This study reported that the frequency of Rh-positive is higher than Rh-negative in all blood groups. In blood group A, Rh-positive is 89.8%; in blood group O, Rh-positive is 89.4%; in blood group B, Rh-positive is 89.9%; in blood group AB, Rh-positive is 91.7%. In conclusion: In this study, the prevalence of blood group A > O > B > AB.

Keywords: ABO, Rh, blood group, blood transfusions.

Introduction:

Red blood cells (RBCs) or erythrocytes are differentiated from each other on the basis of their surface antigen structures. It was Karl Landsteiner who first discovered (1) the ABO blood group (BG) system in 1900 and rhesus (Rh) BG later (2). Blood group typing is the process of testing red blood cells to determine which antigens are present and which are absent. It is standard practice to test for A, B, and D (Rh) antigens and to perform tests for other antigens in selected cases (3). Blood transfusion requires a mandatory crossmatch test to examine the compatibility between donor and recipient blood

groups. Generally, in all crossmatch tests, a specific chemical reaction of antibodies with erythrocyte antigens is carried out to monitor agglutination (4).

However, the ABO and Rh BG system has fundamental importance in transfusions. In clinical laboratories, it is standard procedure to test BGs A (containing only A antigens), B (containing only B antigens), AB (having both A- and B antigens), O (neither A nor B antigens) and Rh (giving information about the presence or absence of Rh antigens). However, unexpected antigens could be

present in some individuals that may not have particular RBC antigens (4).

For successful and safe blood transfusion, it is important to know about the compatibility of donor and recipient BGs, *i.e.*, ABO and Rh. An incompatible or mismatched transfusion would make blood clump or agglutinate, which could lead to serious consequences and sudden death. Therefore, a suitable cross-matching test between the intended donor and the patient is highly recommended and is a part of routine clinical analysis (5).

For Rh D negative mothers, prophylaxis with Rh-Ig effectively mitigates the risk of immunization and production of anti-D. Postnatal immunoprophylaxis is given based on the RhD blood type of the newborn, whereas the antenatal dose is routinely administered to all RhD negative women as the fetal blood type is not known. However, it is now routine practice in several European countries to use noninvasive testing of cell-free fetal DNA in maternal plasma to determine fetal RhD type and avoid unnecessary administration of antenatal Rh-IG to the ~38% to 40% of women who carry an RhD negative fetus (6).

Red blood cell antigens, which are the basis of blood grouping, consist of proteins and carbohydrates attached to lipids or proteins. There are more than 100 blood group systems involving over 500 antigens in which ABO is the most studied group in the human population (7).

This study aims to determine the distribution of blood groups and the rhesus factor in Alexandria City, Egypt.

Materials and methods:

The data was obtained from data records of Alyameny laboratory files in Alexandria city, Egypt, the Blood groups and Rh results for 5928 patients were collected from data records in 19 years (2002-2020), in Al-Raml district the residence of this district coming from most Egyptian governorates from Alexandria to Aswan, so this study near to be about Prevalence of ABO and Rh blood groups in Egypt with limitation in the number of participants is only 5928.

Statistical Analysis:

The data of 5928 patients ABO and Rh blood groups was collected in Excel sheet to calculate the total number of each blood group and calculated the percentage of prevalence for each blood group and Rh factor

Results:

The data was collected from Alyameny laboratory file records for 5928 patients in 19 years (2002-2020), ABO and Rh blood groups

This study showed that blood group A had the highest frequency (32.4%), and the frequency of O, B, and AB blood groups was 31.8%, 25.3%, and 10.5%, respectively, as shown in Table 1 and Figure 1.

This study reported that the frequency of Rh-positive is higher than Rh-negative in all blood groups. In blood group A, Rh-positive is 89.8%; in blood group O, Rh-positive is 89.4%; in blood group B, Rh-positive is 89.9%; in blood group AB, Rh-positive is 91.7%, as shown in Figure 2.

Table 1: Distribution of ABO and Rh blood groups

Blood Group	Males	Females	Males + Females	Total	Percentage%
A +ve	988	736	1724 (89.8%)	1920 A	32.4%
A -ve	124	72	196 (10.2%)		
O +ve	980	704	1684 (89.4%)	1884 O	31.8%
O -ve	92	108	200 (10.6%)		
B +ve	808	540	1348 (89.9%)	1500 B	25.3%
B -ve	84	68	152 (10.1%)		
AB +ve	344	228	572 (91.7%)	624 AB	10.5%
AB -ve	16	36	52 (8.3%)		
Total				5928	100%

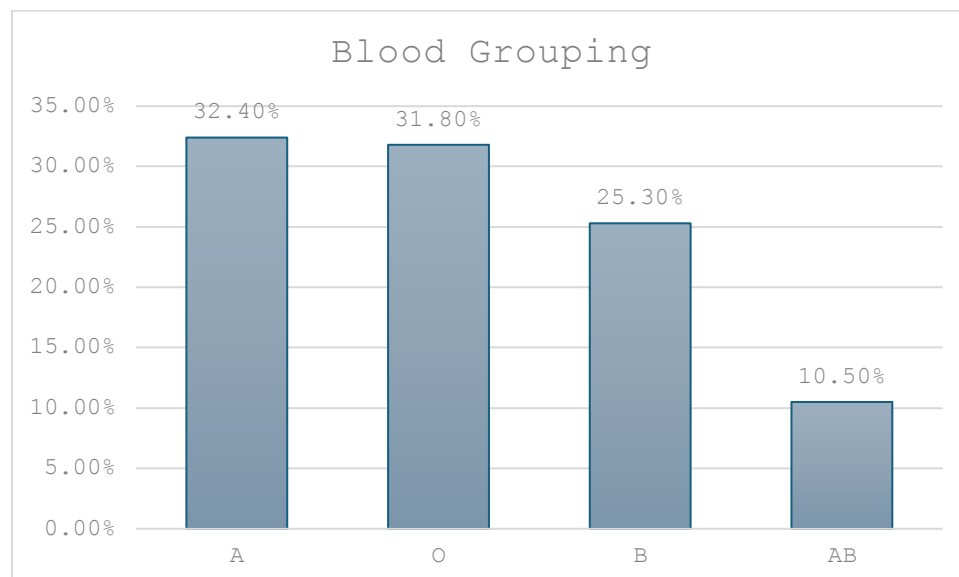


Figure 1: Distribution of ABO and Rh blood groups

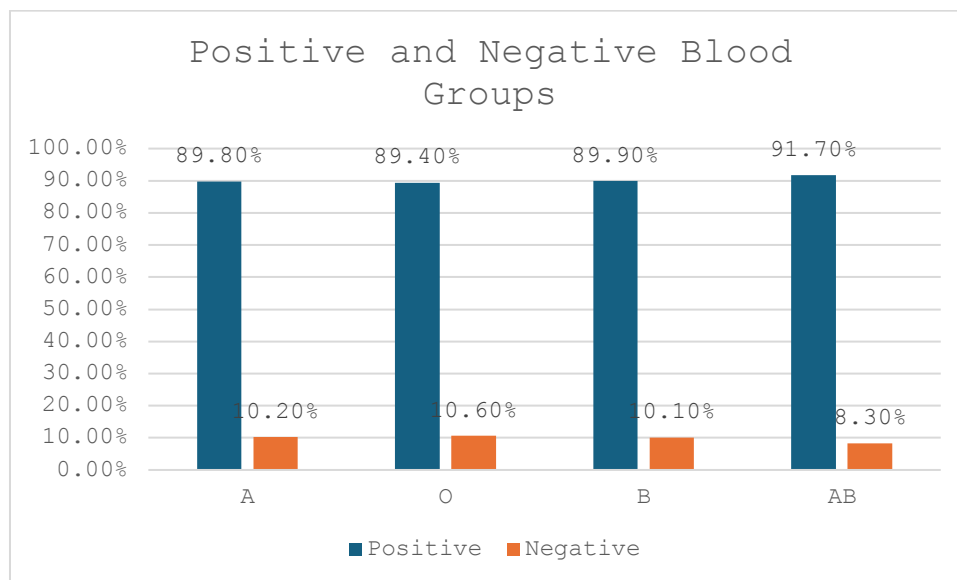


Figure 2: Distribution of Rh-positive and Rh-negative in all blood groups

Discussion:

The distribution of blood groups varies regionally and ethnically and there have been many studies on the distribution of ABO and Rh blood groups in different geographical, ethnic and socioeconomic groups (9).

This study showed that blood group A had the highest frequency (32.4%), and the frequency of O, B, and AB blood groups was 31.8%, 25.3%, and 10.5%, respectively.

comparable with our findings. In a population-based study from China, the most prevalent blood group was A, followed by O, B and AB, and the frequency of ABO and Rh blood groups was significantly different among the ethnic groups in that study (10).

Some studies in Europe reported the same distribution of blood group types as this study, in which blood group A had the highest frequency followed by blood group O, B, and AB, for example a study in Bulgaria reported blood group A (39.96%), O (35.80%), B (16.84%), AB (7.60%) (11), a study in Greece reported blood group A (48.19%), O (34.21 %), B (12.04 %), AB (5.56%)

(11), a study in Cyprus reported blood group A (44.22 %), O (32.45 %), B (13.80%), AB (9.53%) (12).

In 2 studies carried out in Pakistan and India, the most common blood group was B, followed by O, A, and AB (13,14). In a study conducted in Saudi Arabia, the most prevalent blood group was O, followed by A, B, and AB (15),

The results of this and previous studies also showed that AB was the least prevalent blood group, indicating that the gene segregation for the ABO system follows a similar a distribution pattern in various ethnic groups, with certain exceptions (9).

This study reported that the frequency of Rh-positive is higher than Rh-negative in all blood groups. In blood group A, Rh-positive is 89.8%; in blood group O, Rh-positive is 89.4%; in blood group B, Rh-positive is 89.9%; in blood group AB, Rh-positive is 91.7%,

The frequency of Rh-positive blood in other parts of the world was also higher than the Rh-negative blood group, as observed in the current study

(13,8,15). The Rh blood system distribution has remained constant over time.

Conflict of interest: NIL

Funding: NIL

References:

- 1- Landsteiner K. Zur Kenntnis der antifermentativen lytischen und agglutinierenden Wirkung des Blutserums and der lymph. Zentralbl. Bakteri. Parasit. Infekt. 1900;27:357–362.
- 2- Landsteiner K. Ueber Agglutinationserscheinungen normalen menschlichen Blutes. Wien. Klin. Wochenschr. 1901;14:1132–1134.
- 3- Malomgré W, Neumeister B. Recent and future trends in blood group typing. Anal Bioanal Chem. 2009 Mar;393(5):1443-51. doi: 10.1007/s00216-008-2411-3.
- 4- Mujahid A, Dickert FL. Blood Group Typing: From Classical Strategies to the Application of Synthetic Antibodies Generated by Molecular Imprinting. Sensors (Basel). 2015 Dec 31;16(1):51. doi: 10.3390/s16010051.
- 5- Rowley M., Milkins C. Laboratory aspects of blood transfusion. In: Lewis S.M., Barbara J.B., Imelda B., editors. Dacie and Lewis Practical Haematology. 10th ed. Churchill Livingstone; Philadelphia, PA, USA: 2006. pp. 523–554.
- 6- Daniels G, Finning K, Lozano M, et al. Vox Sanguinis International Forum on application of fetal blood grouping: summary. Vox Sang. 2018, 113 (2): pp. 198-201.
- 7- Dzieczkowski JS, Anderson KC. Blood group antigens and therapy in Harrison's Principles of Internal Medicine. 14. New York: McGraw Hill; 1998.
- 8- Ghobadian Z, Sayemiri K, Zeinali M, Sajjadi SM. Distribution of ABO and Rh blood groups in a major ethnic group of the West Iran, the Kurdish population. Asian J Med Sci. 2014;5(3):26–9.
- 9- Tesfaye K, Petros Y, Andargie M. Frequency distribution of ABO and Rh (D) blood group alleles in Silte Zone, Ethiopia. Egypt J Med Hum Genet. 2015;16(1):71–6.
- 10- Liu J, Zhang S, Wang Q, Shen H, Zhang Y, Liu M. Frequencies and ethnic distribution of ABO and RhD blood groups in China: a population-based cross-sectional study. BMJ Open. 2017 Dec 3;7(12):e018476. doi:10.1136/bmjopen-2017-018476
- 11- Gezer S, Akgün N, Akın A, Işıklı A. Eskisehir bölgesinde ABO kan gruplarının sıklığı. Çocuk Sağlığı ve Hastalıkları Dergisi 1987;227-31.
- 12- Atun IH, Hacıbulgur M. Kıbrıs Türklerinde ve komşu ülkelerde kan grupları. Mikrobiyoloji Bülteni 1979;210-4.
- 13- Shakir M, Khan SA, Ghani E. Frequency of ABO and Rh (D) blood groups among blood donors in Rawalpindi/Islamabad area. Pak Armed Forces Med J. 2012;62(2):59–64.
- 14- Giri PA, Yadav S, Parhar GS, Phalke DB. Frequency of ABO and Rhesus blood groups: A study from a rural tertiary care teaching hospital in India. Int J Biol Med Res. 2011;2(4):988–90.
- 15- Sarhan MA, Saleh KA, Bin-Dajem SM. Distribution of ABO blood groups and rhesus factor in Southwest Saudi Arabia. Saudi Med J. 2009;30(1):116–9. PMID:19139784