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# Distribution of ABO Blood Groups and Rhesus Factor (RH) among the population in Tobruk City-East of Libya.

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ARTICLE INFO	ABSTRACT
<i>Article history:</i> Received 5 Dec. 2024 Revised 27 Dec. 2024, Accepted 30 Dec 2024, Available online 15 Mar. 2025	In genetics and clinical research, ABO blood types and the Rhesus (Rh) factor play significant roles in human biology. It has been reported that different populations around the world have different distributions of ABO and Rhesus factor (Rh). This investigation aims to ascertain the distribution of ABO and Rhesus blood groups among the population of Tobruk. Libya The study population
<i>Keywords:</i> ABO Blood group Rhesus (Rh) Tobruk Libya	comprised 854 subjects, aged 17 and 80 years, who were donors and presented at the Blood Bank in Tobruk City, Libya. The sample consisted of 427 males and 427 females. The investigation was conducted from August 2023 to March 2024. The results showed that the percentage of blood groups O, A, B and AB among the studied population was 35.8, 33.2%, 23.2% and 7.8% respectively. Only 11.3% of them were found to be rhesus negative.

#### 1. 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. 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 Hirszfeld 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 (Garratty., et al 2000; Harmening 2018). The ABO blood groups, which include A, B, AB, and O, are determined genetically by the antigens located on the surface of erythrocytes and various other somatic cells. The four phenotypic blood groups-A, B, AB, and O-are established by three allelic genes situated close to the end of chromosome 9's long arm (Eastlund, T. (1998). The Rhesus (Rh) system was identified in 1940, with two terminologies: CcDdEe by Fisher and Race, and Rh/Hr by Wiener his team for this system (Garrstty., et al 2000; Mollison (1994). Two closely connected genes regulate the Rh factor's expression; one gene is responsible for Dd while the other gene controls Cc and Ee (Issitt, PD (1994). Rh-positive people are those who carry this antigen, and Rh-negative people do not. Unlike the ABO system, it is different in that corresponding antibodies, or agglutinins, do not develop spontaneously unless Rh (+ve) blood transfusions sensitize Rh (-ve) highly individuals. Rh antigens are immunogenic. Of the 49 Rh antigens identified so far, the D antigen is the most important. Dnegative individuals produce anti-D when they are exposed to the D antigen through transfusion or pregnancy, causing a hemolytic transfusion reaction or hemolytic disease of the fetus and

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newborn. For this reason, Rh status is routinely determined in blood donors, transfusion recipients and expectant mothers (Sarhan et., al (2009); Abegaz, 2021). Both ABO and Rh blood groups display significant variation in terms of genetics and distribution across various populations. Evidences show variations in blood group distribution among different ethnic groups and regions (Hassan, 2011); Pang et., al 2001). Several other blood group systems exist, such as MNSs, P, Lutheran, Kell Lewis, Duffy, Kidd, Diego, Yt, and so on, each comprising two or more related genes. Nevertheless, these blood types have minimal significance in medical practice and are primarily utilized in the fields of genetics and forensic medicine (Bashwari, L. The study aimed to determine A et., al 2001). the distribution of ABO blood groups among population in The Tobruk city (East of Libya).

## 2. Methodology

#### **Sample Collection**

The study involved 854 participants who were donors and visited the Blood Bank in Tobruk City, LIBYA. Including 427 males and 427 females within the eligible age range of 17 and 80 years, arrived to donate blood during the study duration. The duration of the study was from August 2023 until March 2024. The samples were obtained through venipuncture by using a disposable syringe and promptly moved to a tube containing ethylene diamine tetra cetic acid (EDTA) as an anticoagulant.

#### Measurements

Blood groups were, determined by slide agglutination method. Three blood droops were collected under sterile conditions and placed on tiles designated A, B, and Rh. Antisera A, B, and D were subsequently applied to the respective blood samples, followed by thorough mixing. After five minutes, the blood samples were evaluated for agglutination. The presence of agglutination in sample A indicated blood group A, whereas agglutination in sample B indicated blood group B. Agglutination observed in both samples classified the blood as AB, while the absence of agglutination suggested blood group O. Agglutination in the Rh sample signified Rh positive status, while the lack of agglutination indicated Rh negative status. Blood groups were established based on agglutination using Immucor Inc., Norcross, GA, USA and the results were recorded promptly for each individual.

### **Data Analysis**

The Statistical Package for Social Science software (SPSS) was used to analyze all of the data. Different blood type distributions among males, females, and the population as a whole were shown as percentages. The unpaired "t" test was used to examine the distributions of various blood types between males and females. Additionally, an ANOVA was used to compare the blood group distributions found in this study with those found in several other investigations. The significance level was set at p<0.05.

**Table 1:** Distribution of different ABO blood types between male, female and total studied population in Tobruk

 City, Libya.

Blood group Types	Male Number	%	Female Number	%	Total Gender Number	%
Α	140	33.4	143	33.6	283	33.2
В	89	21.3	110	26.1	199	23.2
AB	41	9.3	29	6.3	70	7.8

0	157	36	145	34	302	35.8
Totall	427	%100	427	%100	854	%100

**Table 2:** Distribution of different Rh blood groups between male, female and overall studied population in Tobruk City, Libya.

Blood group Types	Male Number	%	Female Number	%	Total Gender Number	%
RH	382	88.6	380	88.7	762	88.7
POSITIVE	45	11.4	47	11.2	02	11.2
KH NEGATIVE	45	11.4	47	11.5	92	11.5

**Table 3:** Comparison of distribution of different ABO blood in the present study with other parts of Libya and other studies.

Study	Α	В	AB	0
Present	33.2	23.2	7.8	35.8
Morocco (Benahadi at el.,2013)	32.86	15.80	4.5	46.8
Australia (Hirani.2022)	37.6	13.3	4.2	44.9
Turky (Salduzet at al.,20.15)	43.3	15.0	8.54	33.02
Egypt (Abdelmonem et al., 2019)	35.12	23.12	9.74	31.94
Nigeria (Anifowoshe et al.,2017)	22.7	20.6	3.6	52.9
Saudia Arabia (Sarhan et al.,2009)	33.4	6.0	3.8	56.8
Aljufra. Libya (Asteal.2021)	26.8	21.6	5.4	46.2
Bani Waleed. Libya	31.7	17.7	7.0	43.6
(Ameigaal&Ageel.2019)				
Albiyda. Libya (Saad.2016)	30.7	23.4	8.9	37.4
Wadi Alshati. Libya (Ibrahim.2017)	26.6	19.4	3.4	50.6
Almergeb Provence Libya (Othman	37.7	15.2	5.9	14.2
et al.,2019)				
Sebratha. Libya (Sakal et al.,2019)	34.0	18.13	4.68	43.19
Sikkim. India (Singh. B.2017)	35.34	21.99	7.49	35.18
Sebha. Libya (Matough et al.,2019)	28.0	23.0	7.0	42.0

**Table 4:** Comparison of distribution of different Rh blood in the present study with other parts of Libya and other countries.

Study	Rh +	Rh-
Present	88.7	11.3
Morocco (Benahadi at el.,2013)	91.0	1.0
Australia (Hirani.2022)	85.9	14.1
Turky (Salduzet at al.,20.15)	85.95	14.05

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Egypt (Abdelmonem et al., 2019)	91.78	8.22
Nigeria (Anifowoshe et al.,2017)	94.90	5.1
Saudia Arabia (Sarhan et al.,2009)	92.8	7.2
Aljufra. Libya (Asteal.2021)	85	15
Bani Waleed. Libya	76.2	23.8
(Ameigaal&Ageel.2019)		
Albiyda. Libya (Saad.2016)	83.92	16.08
Wadi Alshati. Libya	93.2	6.8
(Ibrahim.2017)		
Almergeb Provence Libya	84.27	15.73
(Othman et al.,2019)		
Sebratha. Libya (Sakal et	83.53	16.4
al.,2019)		
Sikkim. India (Singh. B.2017)	81.7	18.2
Sebha. Libya (Matough et al.,2019)	99.47	0.53

#### 3. Results and discussion

#### **Distribution of ABO blood groups**

The proportions of A, B, AB and O blood types in the male subjects examined were 33.4, 21.3, 9.3 and 36% respectively (Table 1). For the studied females, the distribution of ABO blood groups was 33.6% for A, 26.1% for B, 6.3% for AB, and 34% for O groups, respectively (Table 1). There was no notable difference in the distribution of ABO blood groups among male and female participants. The prevalence of A, B, AB, and O blood types in the entire studied population were 33.2, 23.2, 7.8, and 35.8% respectively (Table 1).

#### **Distribution of Rh blood groups**

The distribution of Rh<sup>+</sup> and Rh<sup>-</sup> blood groups between studied male subjects were 88.6 and 11.4% respectively and the percentage of Rh positive and Rh-negative blood groups were 88.7 and 11.3% respectively in female studied (Table 2). There was no different in distribution of Rh blood groups between male and female studied. The presentation of Rh positive and Rh-negative groups between total studied population were 88.7 and 11.3% respectively (Table 2).

# Comparing the distribution of different blood groups among this study and other studies

There was significant difference between the distribution of the ABO and Rh blood groups in the current study and several other studies (Table 3 and 4).

Despite the identical ABO and Rh factor groups between all people, blood type prevalence varies by race, ethnicity, and socioeconomic status. This type of research is essential in medical practice, such as blood transfusions and organ transplants (Fung et al., 2014)). This study evaluated the distribution of different blood groups. The blood groups of 854 donors who visited the Blood Bank in Tobruk City, Libya, are proposed for this study. As a result of this study, the percentage of O was more frequency and followed by A, B, and AB blood groups among the population aged 17 and 80 years 35.8%, 33.2%, 23.2% and 7.8% respectively. This result is found O was more frequent while AB was rare and these finding agreement with previous local studies in Almergeb Provence Libya (Othman *et al.*,2023); Aljufra, Libya (Asteal, 2021); Sebratha, Libya (Sakal *et al.*,2019); Bani Waleed, Libya (Ameigaal & Ageel, 2019); Albiyda, Libya (Saad, 2016) as different geography parts (eastern and western Libya). In addition, theses result is agreed with national studied in Australia (Hirani, 2022); Nigeria (Anifowoshe *et al.*, 2017); Morocco (Benahadi *et al.*, 2013); Saudi Arabia (Sarhan *et al.*, 2009). In this study, the distribution of ABO blood groups was no substantial difference among gender subjects.

The result also indicated that 88.7% of Tobruk city's population has Rh positive blood type while 11.3% have Rh negative. Additionally, there were no significant differences in the distribution of Rh blood groups among males and females in the study. This result is agreement with previous local and internation studies Sebha, Libya (Matough *et al.*, 2019); Sikkim, India (Singh, 2017).

Comparisons of the distribution of the ABO and Rh blood groups in the Tobruk population, as obtained in the present study, with those in other studies have revealed significant differences in the ABO and Rh blood groups of the population of Tobruk and in some regions of the world (Abdelmonem et al., 2019; Salduzet et al., 2015; (Guyton & Hall 2006; Rogers & Glendon (2003). The blood group distribution observed in this study was the same that reported in the only studies on blood group distribution among Libyan (Table 3). These results support that blood group distributions vary across different regions worldwide, possible due to genetic variations among diverse populations. Genetic factors and race differences have been reported affect blood group prevalence and to distribution in different parts of the world (Cavalli-Sforza & Feldman 2003; Bangham (2014). Consequently, it is crucial to identify blood groups from various ethnic and geographic areas to address the needs of transfusion services and forensic medicine.

#### 4. Conclusions

This research represents the first comprehensive analysis of ABO blood group frequencies in Tobruk, a city in eastern Libya. Understanding the distribution of blood groups within a specific geographic region is crucial for effective inventory management. Blood banks and transfusion services greatly benefit from knowledge about the prevalence and distribution of various blood types, as it enables them to contribute significantly to the national health system's policy formulation. The findings of this investigation revealed an ABO and Rh blood group distribution that differed markedly from those observed in many other global regions.

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