

Original article

## Evaluation of ABO and Rh Blood Group Frequencies in the Population of Sirte City, Libya

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### Abstract

The distribution of ABO blood groups and Rh factors has been extensively studied, with findings typically similar on the most common blood group, although with regional variations in proportions. This study aimed to assess the prevalence of ABO and Rh blood group systems in the population of Sirte city. Data from 7,127 individuals (4,064 males and 3,063 females) were collected from the archives of the Sirte Passport Center. These records were compiled over intermittent intervals and represented residents from various areas within the city. Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) software. The analysis revealed that blood group O was the most prevalent (54.6%), followed by group A (28.0%), group B (14%), and group AB (3.2%). Additionally, 11.3% of the population was Rh-negative. In Sirte, the distribution of ABO and Rh blood groups followed the pattern: O > A > B > AB, with Rh-positive being the predominant group. These findings are consistent with previous studies conducted in other Libyan cities.

**Keywords.** ABO, Rh, Blood Groups.

### Introduction

Since Karl Landsteiner's groundbreaking discovery of the ABO blood group system in 1901, which identified the presence of A and B antigens on the surface of red blood cells, our understanding of human blood groups has advanced significantly. As of today, the International Society of Blood Transfusion recognizes 47 blood group systems comprising over 354 red blood cell (RBC) antigens [1]. Among these, the ABO and Rhesus (Rh [D]) blood group systems remain the most clinically significant [2, 3]. These antigens are located on the surface of red blood cells, while their corresponding antibodies are present in blood plasma. Individuals possess various combinations of these molecules, which differ in frequency across populations [4]. The prevalence of ABO and Rh blood groups varies considerably among different races, ethnicities, and socio-economic groups across the globe [5]. The diversity of ABO and Rh blood groups in different regions is influenced by numerous factors, including geography, population history, cultural practices, race, and ethnicity. These factors reflect the core genetic makeup of populations as well as dietary habits, environmental influences, and racial characteristics [6]. Understanding the distribution of ABO and Rh blood groups at local and regional levels is crucial for ensuring the availability of safe and effective blood transfusion services [7]. This study aims to assess the distribution of ABO and Rh blood groups in the population of Sirte city. Additionally, it seeks to compare the findings with similar studies conducted in other regions of Libya and globally.

### Methods

A retrospective descriptive study was conducted to search for the distribution of ABO and Rhesus blood groups within the city of Sirte. The data of 7127 (4064 males, 3063 females) was collected from the archives of the Passport Center, Sirte, which were recorded at intermittent periods. The data was statistically analyzed using the Statistical Package for the Social Sciences (SPSS) software (version 26); Descriptive analysis was performed and presented as frequency counts and percentages in tables.

### Results

The total participants from the Sirte city population in this study was 7127 from different regions and different ages. Results show that the male was 4064 (57%) while the female was 3063(43%).

**Table 1. ABO Blood Groups Distribution in Sirte**

Bl. Group	Frequency	Percent (%)
<b>A</b>	1993	28.0
<b>AB</b>	231	3.2
<b>B</b>	1012	14.2
<b>O</b>	3891	54.6
<b>Total</b>	7127	100.0

**Table 2. Rhesus Factor Distribution**

Rh group	Frequency	Percent (%)
Negative	803	11.3
Positive	6324	88.7
Total	7127	100.0

**Table 3. The distribution of each blood group (ABO and Rh)**

Blood Group	Frequency	Percentage (%)
O+	3424	48.042
O-	467	06.552
A+	1801	25.270
A-	192	02.693
B+	898	12.599
B-	114	01.599
AB+	199	02.792
AB-	32	00.448
Total	7127	100

**Table 4. ABO blood groups Distribution in some Libya cities**

City	Blood group A		Blood group B		Blood group AB		Blood group O	
	A +	A -	B +	B -	AB +	AB -	O +	O -
Sirte (%)	25.27	2.69	12.59	1.59	2.79	.44	48.04	6.55
Albyda (%)	26.18	3.98	19.29	4.13	8.19	.76	30.24	7.19
Almergab (%)	32.22	5.43	13.03	2.19	5.20	.76	34.14	7.03
Alzawiya (%)	29.00	4.00	14.00	1.60	3.70	.70	41.00	3.80
Beniwalid (%)	27.60	4.10	11.30	6.11	4.70	2.60	33.40	9.90
Darna (%)	25.60	2.60	22.00	2.30	7.30	.60	34.50	5.10
Fazzan (%)	28.20	2.00	15.00	1.70	4.40	.50	43.90	4.30

## Discussion

In our study, as illustrated in Table 1, blood group distribution showed type O as the most prevalent (54.6%), followed by type A (28%), type B (14.2%), and type AB (3.2%). Whereas, Rhesus factor distribution (Table 2) showed that 803 individuals (11.3%) were Rh-negative (lacking the Rh antigen), while the majority, 6,324 (88.7%), and were Rh-positive (carrying the Rh antigen). As detailed in table 3, the distribution of ABO-Rh blood group combinations revealed O+ as the most prevalent (48%), followed by A+ (25%), B+ (12.5%), O- (6.5%), AB+ (2.7%), A- (2.6%), B- (1.5%), and finally AB- (0.4%).

Our findings supported with studies by Hirani et al. (2022), in Australia [8] and Ahmed et al. (2019) [9] in Karachi, where blood group O RhD+ was reported as the most prevalent (38.4% and 35.6%, respectively), followed by A RhD+ (32.0% and 24.1%). Conversely, AB RhD+ exhibited the lowest prevalence in both studies (3.7% and 7.2%).

In contrast, our findings differ from studies by Noshkey, A.M.I.N.A et al. (2019) [10] in Pakistan and Tulika Chandral and Ashish Gupta (2012) [11] in Northern India, which identified blood group B as the most prevalent, followed by groups O, A, and AB.

While our findings agree with prior studies conducted in Libyan cities, including Al-Bayda [4], Al-Mergab [12], Al-Zawiya [13], Beni-Walid [14], Darna [5], and Fazzan [2]. As summarized in Table 4, blood group O positive was consistently the most prevalent across all regions, followed by A positive. However, differences emerged in the distribution of blood groups B and AB, highlighting potential regional variability.

## Conclusion

In Sirte, the ABO and Rh blood group distribution adhered to the global pattern of O > A > B > AB, with Rh+ predominance. These findings are supported by data reported in other Libyan cities. Future research should incorporate serological and genetic analyses to further characterize the prevalence of ABO/Rh antigens in the population. The study's outcomes hold significant implications for public health planning, blood bank resource management, population genetics, clinical diagnostics, and improving overall health outcomes in the region.

**Conflict of interest.** Nil

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