

# A Cross Sectional Preliminary Study on the Prevalence of ABO and Rhesus Blood Groups in Bani Waleed City, Libya

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## Abstract

**Background:** The distribution of ABO and rhesus (Rh) blood groups has been reported to be different in several world populations. There have been few studies about blood groups among Libyan population. **Aims:** The study aims to determine the distribution and frequency of ABO and Rh blood groups among Libyan population in Bani Waleed city. **Subjects and Methods:** The study group had included 344 participants of both genders aged between 15 and 80 years. Blood samples were collected for ABO and Rh blood group analysis from September to December 2018. **Results:** The percentage of male participants was 55.8% and 48.2% were female. The highest percentage (30.2%) were among the age group of 23–32 years. O blood group was the most common (43.6%), followed by A (31.7%), B (17.7%), and finally, AB blood group (7.0%). The percentage of Rh positive (Rh<sup>+</sup>) was 72.2% and of Rh negative (Rh<sup>-</sup>) was 23.8%. Moreover, the prevalence of ABO with Rh<sup>+</sup> was 33.4%, 27.6%, 11.3%, and 4.7% for O<sup>+</sup>, A<sup>+</sup>, B<sup>+</sup>, and AB<sup>+</sup>, respectively. The prevalence of ABO with Rh<sup>-</sup> was 9.9%, 6.11%, 4.1%, and 2.6% for O<sup>-</sup>, B<sup>-</sup>, A<sup>-</sup>, and AB<sup>-</sup>, respectively. **Conclusion:** The distribution of ABO blood group in the present study is ordered of O > A > B > AB with majority of Rh<sup>+</sup> and higher frequencies of Rh<sup>-</sup>. The findings of this study will contribute in health services and use them as database to know detailed information of blood types such as for blood bank and blood transfusion and also to be used in population studies.

**Keywords:** ABO, Bani Waleed, blood groups, Libya, rhesus factor

## INTRODUCTION

The ABO blood groups were discovered by Landsteiner in 1901,<sup>[1]</sup> who divided them into four types, namely A, B, AB, and O blood groups. This division depends on the presence or absent of certain antigens on red blood cell surface.<sup>[2]</sup> These antigens are inherited from parents and controlled by gene called ABO glycosyltransferase that located on chromosome 9q34.1.<sup>[3]</sup> Currently, there are 700 antigens that have been reported into 30 blood group systems; and ABO is the most studied group in the human population.<sup>[4]</sup>

The ABO blood groups have an important role in blood transfusion, where blood donor group must be identical with blood receive group.<sup>[5]</sup> In addition, the ABO blood groups are important in different medical fields; for example, there is a relationship between race and ABO blood group distributions, and it has been important in immunohematology anthropological research. Furthermore, an association was reported between ABO blood group and many diseases such as cancer,<sup>[6-8]</sup> heart diseases,<sup>[9]</sup> and diabetes mellitus.<sup>[10]</sup>

Rhesus (Rh) factor was discovered by both Landsteiner and Weiner.<sup>[11]</sup> There are two types of Rh factors depending on the presence or absence of antigen D on red cell surface (Rh<sup>+</sup> and Rh<sup>-</sup>).<sup>[12]</sup> Rh antigens are determined by three pairs of allelic genes that located on chromosome one.<sup>[13]</sup> Rh factor is important during blood transfusion and pregnancy because it causes hemolytic transfusion reaction or hemolytic disease of a newborn when the Rh<sup>-</sup> mother has been sensitized to Rh<sup>+</sup> blood.<sup>[12]</sup>

The distribution of ABO and Rh blood groups has been reported in different populations of the world. Many studies have found that blood group O was the most common type in the USA (46.6%),<sup>[13]</sup> China (34%),<sup>[14]</sup> and Denmark 42.3%.<sup>[15]</sup> The proportion of Rh<sup>-</sup> reported was different according to the population studied.

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It was 14.6% in the USA,<sup>[13]</sup> 17.9% in Denmark,<sup>[15]</sup> and 1.0% in China.<sup>[14]</sup> The frequency of Rh<sup>-</sup> blood group in Al Bayda city in eastern Libyan was reported to be 16%.<sup>[16]</sup>

The present study was aimed to investigate the distribution of ABO and Rh blood groups in Bani Waleed city population and to compare them with other results from similar studies within Libya and all over the world.

## SUBJECTS AND METHODS

### Study subjects

This is a cross-sectional study carried out between September and December 2018. The participants were recruited from different clinics including Bani Waleed Hospital, Bani Waleed University, and Bani Waleed private clinics. The study group included 344 individuals of both genders aged between 15 and 80 years. Clinical characteristics were obtained for each participant using an Arabic structured questionnaire including name, gender, age, weight, height, medical history (including diabetes mellitus, heart diseases, hypertension, and anemia), type of blood group, and address of residence. The participants were taken from different regions of Bani Waleed to detect if there is an effect of geographic factor on blood group distribution. Each participant gave his/her consent about the involvement in this study.

### Blood sample collection and blood group determination

Peripheral blood was collected from each participant in the study. Blood groups were done by slide agglutination method. ABO blood group was determined from each sample by agglutination using anti-A and anti-B antibodies (Immucor Inc., Norcross, GA, USA). Rh factor was determined by agglutination using anti-D antibody (Immucor Inc., Norcross, GA, USA).

### Statistical analysis

The proportion of the frequencies and distributions of ABO and Rh blood groups was analyzed using SPSS version 19.0 (SPSS, Chicago, IL, USA). The Chi-square test was used to evaluate the differences in ABO and Rh blood groups among the different groups across all categories and characteristics.  $P < 0.05$  was considered to be statistically significant.

## RESULTS

Table 1 shows the distribution of ABO and Rh blood groups in 344 participants according to gender, age, and geographic location. About 55.8% of the participants were male, whereas

44.2% were female. The age distribution of the participants was 16.8%, 30.2%, 23.5%, 13.0%, and 6.6% for the age groups of 12–22, 23–33, 34–44, 45–55, and 46–66 years, respectively.

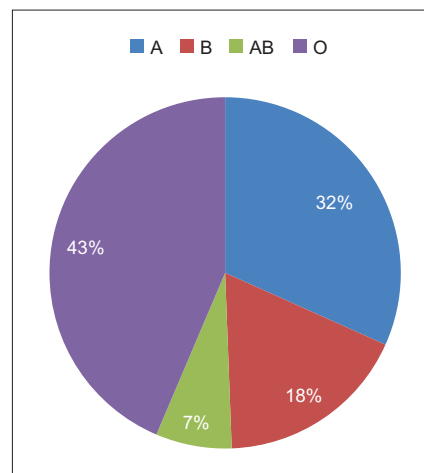


Figure 1: Pie chart shows the distribution of ABO blood group in Libyan population in Bani Waleed city

Table 1: Gender, age and geographic location of study population

Characters	Frequency (n)	Percentage (%)
GENDER		
Male	192	55.8%
Female	152	44.2%
AGE GROUP		
12-22	58	16.8%
23-33	103	30.2%
34-44	81	23.5%
45-55	45	13.0%
56-66	23	6.6%
Above 66	34	9.85%
REGION		
Center of city	83	24.1%
Athara	73	21.2%
Aloteieen	69	20.1%
Industrial area	44	12.8%
Tenenai	26	7.6%
51 area	21	6.1%
Almardom	13	3.8%
Airport area	8	2.3%
Ashmieg	7	2.0%

Table 2: Gender distribution of ABO blood group among study subjects

Gender	Blood Group								Total
	A		B		AB		O		
	Frequency (n)	Percentages	Frequency (n)	Percentages	Frequency (n)	Percentages	Frequency (n)	Percentages	
Male	58	30.2	38	19.8	14	7.3	82	42.7	192
Female	51	33.5	23	15.1	10	6.6	68	44.7	152
Total	109	31.7	61	17.7	24	7	150	43.6	344

**Table 3: Geographic distribution of ABO blood group among study subjects**

Region	Blood group								Total
	A		B		AB		O		
	Frequency (n)	Percentages	Frequency (n)	Percentages	Frequency (n)	Percentages	Frequency (n)	Percentages	
Athara	22	30.1	17	23.3	4	5.5	30	41.1	73
City centre	24	28.9	15	18.1	7	8.4	37	44.6	83
Industrial area	12	27.3	10	22.7	3	6.81	19	43.2	44
Aloteieen	22	31.9	13	18.8	3	4.3	31	44.9	69
51 area	11	52.4	0	0	1	4.8	9	42.9	21
Tenenai	12	46.1	2	7.7	4	15.4	8	30.8	26
Ashmieg	2	28.5	1	14.3	1	14.3	3	42.9	7
Airport area	2	25	0	0	1	12.5	5	62.5	8
Almardom	2	15.4	3	23	0	0	8	61.5	13
Total	109	31.7	61	17.7	24	7	150	43.6	344

**Table 4: Geographic distribution of Rh blood group among study subjects**

Region	Rhesus group			
	Rh+ *		Rh- *	
	Frequency (n)	Percentages	Frequency (n)	Percentages
Athara	59	80.8	14	19.2
City center	65	78.3	18	21.7
Industrial area	35	79.5	9	20.4
Aloteieen	50	72.5	19	27.5
Airport area	5	62.5	3	37.5
51 area	18	85.7	3	14.3
Tenenai	19	73	7	27
Ashmieg	1	14.3	6	85
Almardom	10	77	3	23
Total	262	76.2	82	23.8

\*There was a significant difference in the Rhesus type between the different regions of Bani Waleed City using Chi-square test

**Table 5: Gender distribution of Rh blood group among study subjects**

Gender	Rhesus type				Total
	Rh+ *		Rh- *		
	Frequency (n)	Percentage	Frequency (n)	Percentage	
Male	148	77.1%	44	22.9%	192
Female	114	75%	38	25%	152
Total	262	76.2	82	23.8	344

\*No significant difference between male and female using Chi-square test

About 9.85% were above 66 years old. The mean age of all the participants was 34.87 years.

The geographic location of the participated individuals belongs to nine areas of Bani Waleed city, namely Center of the city (24.1%), Athara area (21.2%), Aloteieen (20.1%), Industrial area (12.8%), Airport area (2.3%), Tenenai area (7.6%), 51 area (6.1%), Almardom area (3.8%), and Ashmieg area (2.0%).

#### Distribution of ABO blood groups

The distribution of ABO blood groups is illustrated in Figure 1. Type O was the most prevalent (43%), whereas AB type was

**Table 6: Distribution of ABO and Rh blood groups among study subjects**

Blood group	Frequency	Percentage
A-	14	4.1%
A+	95	27.6%
AB	9	2.6%
AB+	16	4.7%
B-	22	6.4%
B+	39	11.3%
O-	34	9.9%
O+	115	33.4%

**Table 7: Gender distribution of ABO and Rh blood groups among study subjects**

Gender	A-	A+	AB-	AB+	B-	B+	O-	O+	P
Male	6 3.1%	52 27.0%	5 2.6%	10 5.2%	16 8.3%	22 11.4%	16 8.3%	65 33.8%	0.669
Female	8 5.2%	43 28.2%	4 2.6%	6 3.9%	6 3.9%	17 11.1%	18 11.8%	50 32.8%	
Total	14	95	9	16	22	39	34	115	

the least prevalent (7%). The frequencies of ABO blood groups between genders were analyzed, as illustrated in Table 2 with no significant difference between them ( $P = 0.687$ ). The frequencies of ABO blood group among geographic regions of Bani Waleed are given in Table 3 with no significant difference between them ( $P = 0.48$ ).

#### Distribution of rhesus blood group in study population

The frequency of Rh<sup>+</sup> in the total sample was 76.2%, whereas Rh<sup>-</sup> was 23.8% as illustrated in [Table 4]. The frequencies of Rh type showed a significant difference ( $P = 0.017$ ) between the different geographic regions of Bani Waleed using the Chi-square test [Table 4]. On the other hand, no significant difference in the frequencies of Rh type among genders was found [Table 5].

#### Distribution of ABO and rhesus blood groups in study population

The frequencies of ABO with Rh blood groups are presented in Table 6. The O<sup>+</sup> type was the most prevalent (33.4%), whereas the AB<sup>-</sup> was the least prevalent (2.6%).

The frequencies of ABO and Rh types among genders are presented in Table 7. No significant difference was seen among genders ( $P = 0.669$ ).

## DISCUSSION

The prevalence and distribution of blood groups have been reported to be different in different parts of the world attributed to genetic factors and race differences.<sup>[17,18]</sup> This type of study has an important role in medical practice such as blood transfusion service and organ transplants.<sup>[19]</sup>

The results of this study had shown that O blood group was the most frequent, followed by A group, B group, and finally, AB blood group. These results are in good agreement with the previous local studies in Al Bayda city in eastern Libyan<sup>[16]</sup> and western Libya.<sup>[20]</sup> Moreover, similar results were reported internationally in the USA,<sup>[13]</sup> China,<sup>[14]</sup> Mauritania,<sup>[21]</sup> Sudan,<sup>[22]</sup> and Saudi Arabia.<sup>[23]</sup> These results suggest that O blood type is the most common and AB is the least common in most world populations. On the other hand, there are other studies that reported different proportions of ABO blood groups, such as the study in Pakistan that reported blood Group B was the most common.<sup>[24]</sup> Likewise, A blood group was reported to be the most common in Nepal and Syrian populations.<sup>[25,26]</sup> Moreover, our study revealed that gender or location has no significant effect on the frequency of ABO blood groups which are in agreement with a previous study carried out in Nigeria.<sup>[27]</sup>

As per the results related to Rh blood group, Rh<sup>+</sup> was the highest in our study population (76.2%) compared to (23.2%) Rh<sup>-</sup> group. However, our population with Rh<sup>-</sup> blood group are higher than those reported internationally in Tanzania (3.2%),<sup>[28]</sup> the USA (14.6%),<sup>[13]</sup> and China 1.0%.<sup>[14]</sup> Local results of Al Bayda city in eastern Libya reported 16% of the study population with Rh<sup>-</sup> blood group<sup>[16]</sup> and 8% of Rh<sup>-</sup> in the Fezzan region.<sup>[29]</sup> Many studies had concluded that Rh<sup>+</sup> is a dominant antigen in contrast with Rh<sup>-</sup>.<sup>[22,30]</sup>

Knowledge of availability and type of blood groups is important for more efficient delivery of blood bank services. Further, blood group for every individual must be indicated on national identity cards and driving licenses. It will be of tremendous use in case of emergencies when urgent transfusion of yet to be cross-matched blood is required.

## CONCLUSION

The distribution of ABO blood group in Bani Waleed city is in the order of O > A > B > AB with higher frequencies of Rh<sup>-</sup> than reported internationally. The data of the current study and other studies of different geographical regions of Libya will be useful to health planners to face future health challenges in the region.

#### Study limitations

Study limitations include small sample size and the inability to study the effect of race on the distribution of ABO and Rh blood groups in different regions of the country. This can be suggested as an extension of this important study all over Libya.

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Nil.

#### Conflicts of interest

There are no conflicts of interest.

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## ملخص المقال باللغة العربية

دراسة أولية مستعرضة عن توزيع الزمرة الدموية (فصائل الدم) وعامل الروديوم في مدينة بني وليد، ليبيا

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الهدف: تهدف هذه الدراسة إلى تحديد توزيع وتواتر فصائل الدم وعامل الروديوم بين السكان الليبيين في مدينة بني وليد.

الطرق والأساليب: شملت مجموعة الدراسة 344 مشاركاً من كلا الجنسين الذين تتراوح أعمارهم بين 15 و 80 عاماً. تم جمع عينات الدم لتحليل فصيلة وعامل الروديوم (الريوسوس) (Rh) من سبتمبر إلى ديسمبر 2018.

النتائج: كانت النسبة المئوية للمشاركين 55.8% ذكور والباقي إناث. وكانت أعلى نسبة (30.2%) بين الفئة العمرية من 23 إلى 32 سنة. كانت فصيلة الدم (O) الأكثر شيوعاً (43.6%)، تليها فصيلة (A) (31.7%)، ثم فصيلة (B) (17.7%)، وأخيراً فصيلة الدم (AB) (7.0%). كانت النسبة المئوية لعامل الروديوم الموجب (Rh<sup>+</sup>) (72.2%) والسالبة (Rh<sup>-</sup>) (23.8%). علاوة على ذلك، كان معدل انتشار فصائل الدم ذات (Rh<sup>+</sup>) كالاتي 33.4% فصيلة (O<sup>+</sup>)، 27.6% فصيلة (A<sup>+</sup>)، 11.3% فصيلة (B<sup>+</sup>)، و 4.7% فصيلة (AB<sup>+</sup>). كما كان معدل انتشار فصائل الدم ذات (Rh<sup>-</sup>) كالاتي 9.9% فصيلة (O<sup>-</sup>)، 6.11% فصيلة (B<sup>-</sup>)، 4.1% فصيلة (A<sup>-</sup>)، و 2.6% فصيلة (AB<sup>-</sup>).

الاستنتاج: ترتيب توزيع فصيلة الدم في هذه الدراسة هي (O) < (A) < (B) < (AB)، مع غالبية الفصائل تحمل عامل الروديوم الموجب (Rh<sup>+</sup>). ستساهم نتائج هذه الدراسة في الخدمات الصحية مثل بنك الدم ونقل الدم واستخدامه كمعلومات مهمة في الدراسات السكانية.

الكلمات المفتاحية: فصائل الدم، عامل الروديوم (الريوسوس)، بني وليد، ليبيا.