ABO and Rhesus Blood Group Distribution and Frequency among Blood Donors at El-Marj and Al-Bayda Cities in Northeastern of Libya

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ABO and Rhesus Blood Group Distribution and Frequency among Blood Donors at El-Marj and Al-Bayda Cities in Northeastern of Libya

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ABSTRACT

Background: *The ABO and Rh blood group antigens are the most predominantly used blood group antigens in clinical services and are utilized to shun transfusion reactiveness and maternal mortalities. The present study aims to determine the frequency and distribution of ABO and Rh (D) in the two cities in northeastern Libya, EL-Marj and Al-Bayda and make a comparison between the two cities according to characteristics of blood groups in each one.*

Methods: *A retrospective study was carried out at the blood banks of two cities in the northeastern of Libya EL-Marj and Al-Bayda by studying all records of the last years, and making comparisons between the two cities. it collected information about 24823 donors from records of blood banks in both cities.*

Result: *the number of the donors that have been studied is 24823 donors. It shows the year 2021 has more frequency for donors 9358 (37.7%). The most frequent ABO blood groups were O, then A (36.4%) and (29.7%), respectively, whereas, the smallest frequent one was AB (8.9 %). As for the rhesus factor, the Rh-positive comprised (84.9%) and the Rh-negative (15.1%) of donors.*

Conclusions: *The current study deduces that the most common blood group is O and the least common is AB among the blood donors at Al-Bayda and EL-Marj cities in Libya. Concerning the Rh blood group system, the Rh-positive donor's proportion was 84.9% and the Rh-negative was 15.1%.*

Keywords: *Blood group, ABO, Rhesus factor, Blood bank*

توزيع وتكرار فصائل الدم و العامل الريزيسي بين المتبرعين بالدم في مدينتي المرج والبيضاء شمال شرق ليبيا

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الخلاصة

الخلفية: مستضدات فصيلة الدم ABO و Rh هي مستضدات فصيلة الدم الأكثر استخدامًا في الخدمات السريرية وتستخدم لتجنب تفاعلات نقل الدم ووفيات الأمهات. تهدف الدراسة الحالية إلى تحديد تواتر وتوزيع ABO و Rh (D)في مدينتي المرج والبيضاء شمال شرق ليبيا وإجراء مقارنة بين المدينتين حسب خصائص فصائل الدم في كل منهما.

طرق البحث: أجريت دراسة استرجاعية على بنوك الدم في المدينتين من خلال دراسة جميع سجلات السنوات الماضية وإجراء المقارنات بين المدينتين. وجمعت معلومات عن 24823 متبرعاً من سجلات بنوك الدم في كلا المدينتين.

النتيجة: عدد المتبرعين الذين تمت دراستهم هو 24823 متبرعا. ويظهر أن عام 2021 لديه تكرار أكبر للمتبرعين 9358 (37.7%). كانت فصيلة الدم الأكثر شيوعاً هي(O) ، ثم (A), (36.4%) و(29.7%)، على التوالي، في حين أن الاقل إنتشاراً كانت (AB) (8.9%) , أما بالنسبة لعامل الريسوس، فكان العامل الريسوسي الموجب (84.9%) والعامل الريسوسي السلبي (15.1%) من المتبرعين.

الاستنتاجات: توصلت الدراسة الحالية إلى أن فصيلة الدم الأكثر شيوعا هي O والأقل شيوعا هي AB بين المتبرعين بالدم في مدينتي البيضاء والمرج في ليبيا. فيما يتعلق بنظام فصيلة الدمRh ، كانت نسبة المتبرعين ذوي عامل Rh الإيجابي 84.9% وكانت نسبة المتبرعين بعامل Rh السلبي 15.1%.

الكلمات المفتاحية: فصيلة الدم، العامل الريسوس، بنك الدم.

INTRODUCTION

Blood is the most important body fluid, that is liable for the conveyance of victuals, hormones, and enzymes all over the body (Tesfaye, et al. 2015). It consists of two parts one is a fluid called plasma and another is cells called blood cells (red blood cells (RBC), white blood cells (WBC), and platelets). Concerning the cells, the RBC consists of a cell membrane containing many antigens that are produced from glycolipids and glycoproteins. Predicated on the surface RBC antigens, more than 100 blood group systems have been recognized. nevertheless, the ABO and Rh blood group antigens are the most predominantly used blood group antigens in clinical services and are utilized to shun transfusion reactiveness and maternal mortalities (Singh , et al. 2018).

The ABO blood groups were the initial human blood group system that was disclosed by Karl Landsteiner in 1901 (Garratty, et al. 2000). Then after that, Landsteiner and Wiener recognized the rhesus factor of the blood group in 1941 (Rahman , et al. 2004). It has been demonstrated that both these two systems are the chief, for blood transfusion purposes (Garg, et al. 2014).

Detection of the ABO blood group system freed the way to unearths in the field of immunohematology, blood transfusion among people, unmatched pregnancy, forensics, physiology, and the uncovering of else blood group systems (Jolly, 2000).

The ABO blood group scheme is split into four blood sorts depending on the existence or not of A and B surface antigens. The blood groups are A, B, O and AB. ABO blood group system is significant for the reason that A and B are vigorously antigenic and anti-A and anti-B are in a natural manner happening antibodies present in the serum of persons missing the corresponding antigen. These antibodies are able to bring out intravascular hemolysis in the event of mismatched transfusion (Harmening, 2018).

Rh antigens are very immunogenic. Out of 49 Rh antigens specified until now, the D antigen is the primary. D-negative individuals yield anti-D if they encounter the D antigen during transfer or conceiving which leads to hemolytic transfusion reaction or hemolytic illness of the embryo and

neonatal. On behalf of this reason, the Rh condition is monotonously estimated for blood donors, transfusion receivers, and maternal care (Dean , 2005).

Besides their importance in blood transmission practice, the ABO and Rh blood groups are beneficial in medical research, population inherited investigations, studying population migration patterns as well as analyzing particular medicolegal matters, especially moot parenthood cases (Khan, et al., 2004).

Anyone from mankind has the same blood group systems; despite that they vary in the prevalence rates of certain types. The incidence of ABO and Rh groups differs obviously in dissimilar ethnicities, racial groups, and socio-economic assemblies in various regions of the globe (Garg, et al. 2014). The ABO and Rh groups distribution varies among different regions and races of the world. Blood group A was the most frequent in Japan, while in India, B had the highest frequency, concerning blood group O was the predominant blood group in other peoples such as Chinese, Africans, and Americans. A study by Biruk Legese, in Ethiopia showed that blood group O was the predominant and was followed by A, B, and AB and most of the blood donors' blood groups were Rh-positive (91.5%)(Legese, et al. 2021).

Sanjay Kumar Thakur, and et al (2022) conducted a study in India, which showed that the highest proportion of blood group was B+Ve and the lowest proportion of AB-Ve (Thakur, et al. 2023), Another study carried out in Saudi Arabia by Salwa Hindawi and others in 2023 demonstrates that the highest frequency of one of the blood groups was B (47.3%) (Hindawi, et al., 2023), As well, a study was performed in Australia to determine the prevalence of the blood groups and found that O was the highest one (Hirani, et al., 2022).

The cognition of the spread of ABO and Rh blood groups in the community is cardinal for the administration of blood bank storage. It is substantial to have knowledge of the distribution of blood groups in any community. So the present study was designed for the aim to determine the frequency and distribution of ABO and Rh (D) in the two cities in northeastern Libya EL-Marj and Al-Bayda and make a comparison between the two cities according to characteristics of blood groups in each one.

Methodology

Materials and methods:

The present retrospective study was carried out at the blood banks of two cities in northeastern Libya EL-Marj and Al-Bayda by studying all records of the last years in (EL-Marj 2018, 2019, 2021, and 2022) and (Al-Bayda from 2018 to 2022) and it had been obtained all information about the type of blood group, gender and date of donation to determine the most spread blood group and make comparison between the two cities. It collected information about 24823 donors from records of blood banks in both cities.

Statistical analysis:

All data collected have been entered into the software package SPSS version 21 was used to perform the statistical analysis, make tables, and draw figures.

Ethical approval

The study did not require a review board approval. Because this study does not involve any risk to participants and the participant's name is anonymous (no need to write the participant's name). Furthermore, all the data have already been obtained from the participants in a cooperative way.

RESULTS

The present study considered a comprehensive study about the situation of distribution of ABO and Rh factor blood groups in northeastern Libya because, we have taken data about all donors, which came to blood banks in the last five years (from 2018 to 2022) in two cities (Al-Bayda and EL-Marj) which are considered from large cities in the northeastern of Libya, where was the number of the donors which have been studied 24823 donors (participants or subjects of the study), to identify and study how the distribution of blood grouping between people in this region. In the beginning, as can be seen in Table (1), it appears that the year 2021 has more frequency for donors 9358 (37.7%)

Table 1: Distribution of blood donors in (Al-Bayda and EL-Marj) according to each year of the years of study

Parameter		frequency	percent
Year of the donation	2018	3221	13.0
	2019	3563	14.4
	2020	1351	5.4
	2021	9358	37.7
	2022	7330	29.5
Total		24823	100.0

Observable thing, when it had been looked at Table 2 that the most frequent ABO blood groups were O then A (36.4%) and (29.7%), respectively, whereas, the smallest frequent one was AB (8.9 %).

Table 2: Distribution of types ABO blood group for all the donors

Parameter		frequency	percent
Blood group type	A	7371	29.7
	AB	2202	8.9
	B	6216	25.0
	O	9034	36.4
	Total	24823	100.0

As for the rhesus factor, the Rh-positive comprised (84.9%) and the Rh-negative (15.1%) of donors as shown in Table 3.

Table 3: Distribution of the blood donors in accordance with the Rh factor

Parameter		frequency	percent
Rhuses factor	negative	3738	15.1
	positive	21085	84.9
	Total	24823	100.0

As regards the distribution in terms of gender the vast majority were male with 98.6%.

Table 4: Distribution of the blood donors in consonance with gender

Parameter		frequency	percent
The Gender	female	354	1.4
	male	24468	98.6
	Total	24823	100.0

Although we did not obtain statistics on the number of donors in the city of El-Marj in 2020, the number of donors there is more than in the city of Al-Bayda, and Figure 1 shows this.

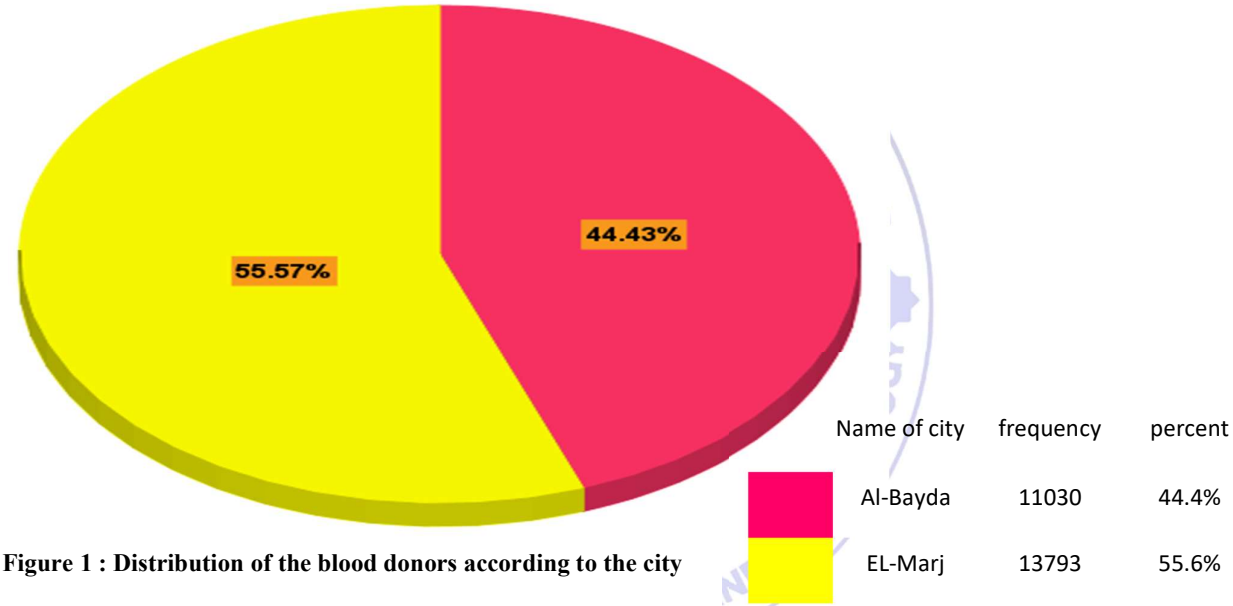


Figure 1 : Distribution of the blood donors according to the city

The following tables show the comparison between the two cities of the study to obtain some differences if there are any, this comparison has been in terms of many aspects such as the distribution of donors in both cities concerning the type of blood group, Rh-factors, gender, and year of donation to recognize any variances.

Table 5 : Comparison between Al-Bayda& EL-Marj cities according to results of each year

The parameter		The City				P value
		Al-Bayda		EL-Marj		
		Frequency	Percent	Frequency	Percent	
Results of each year	2018	2435	22.1	786	5.7	0.000
	2019	2323	21.1	1240	9.0	0.000
	2020	1351	12.2	--	--	0.000
	2021	2072	18.8	7286	52.8	0.000
	2022	2849	25.8	4481	32.5	0.000
	Total	11030	100.0	13793	100.0	

Concerning differences between the two cities in the type of blood group Table 5 illustrates that blood group O is a more frequent blood group in Al-Bayda and EL-Marj) 33.3 %, and 38.8%,

respectively, but there are differences, where B blood group is the second highest blood group 32.9% in Al-Bayda, while in EL-Marj city with few percentages of 18.6 % and comes in the third rank.

Table 6: Comparison between the two cities according to ABO blood group

The parameter		The City				P value
		Al-Bayda		EL-Marj		
		Frequency	Percent	Frequency	Percent	
Blood group	A	2766	25.1	4605	33.4	0.000
	AB	955	8.7	1247	9.0	0.000
	B	3632	32.9	2584	18.7	0.000
	O	3677	33.3	5357	38.8	0.000
	Total	11030	100.0	13793	100.0	

Table 7: Comparison between the two cities according to Rhesus-factor

The parameter		The City				P value
		Al-Bayda		EL-Marj		
		Frequency	Percent	Frequency	Percent	
Rhuses factor	negative	978	8.9	2760	20.0	0.000
	positive	10052	91.1	11033	80.0	0.000
	Total	11030	100.0	13793	100.0	

Table 8: Comparison between the two cities according to the distribution of Rh antigens per blood group among donors

parameters		The City					
		Al-Bayda			EL-Marj		
		Rhuses factor		Total	Rhuses factor		Total
		negative	positive		negative	positive	
ABO blood group	A	197	2569	2766	895	3710	4605
	AB	102	853	955	241	1006	1247
	B	213	3419	3632	548	2036	2584
	O	466	3211	3677	1076	4281	5357
	Total	978	10052	11030	2760	11033	13793

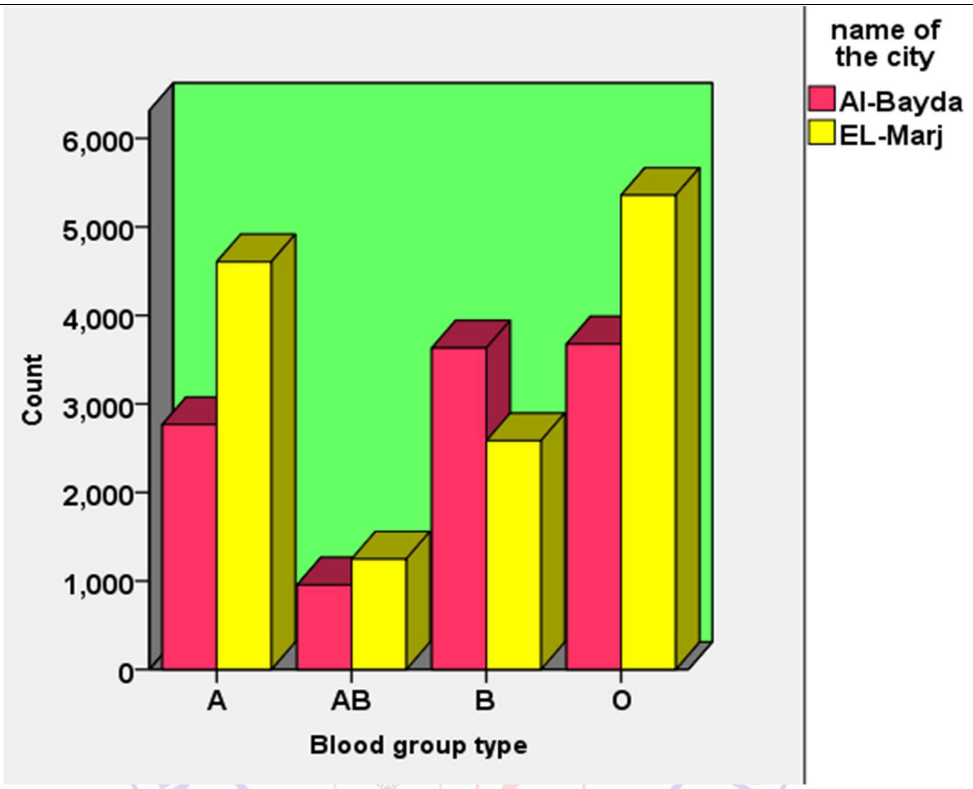


Figure 2: Comparison between the two cities according to ABO blood group

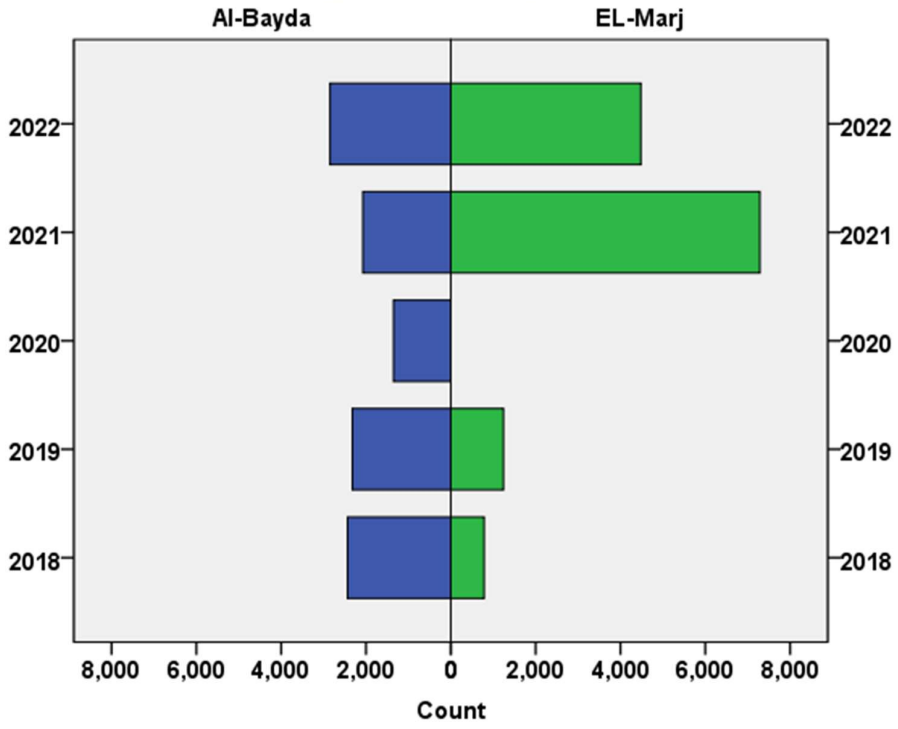


Figure 3: Comparison between the two cities according to the year of donation

DISSCUSION

The present study identified how the way of the prevalence of ABO and Rh factors amongst blood donors in northeastern Libya in the Al-Bayda and EL-Marj cities. The prevailing blood group in this study was type O and the lowest spreading was AB. These findings are consistent with a study in Tanzania, which likewise demonstrated the preponderant group to be O and the least frequent to be AB (Jahanpour, et al. 2017). A similar study carried out in Al-Bayda city in October 2016 by Kawakeb A.O.Saad concluded the same findings where blood group O was unearthed to be the uttermost common type (30 %), succeeded by groups A (26%), while AB group was the least (Saad, 2016).

While in Another study conducted in India demonstrated that the extremely popular blood group was B (32.07%) and the least common being AB (10.53%). Blood group 'O' and 'A' had the same frequency (Garg, et al. 2014).

Furthermore, this study corroborated that Rh+ positive has the highest proportion of 84.9%, whilst Rh- negative has the lowest percentage frequency of 15.1%, these findings go with Kawakeb's study which was mentioned before where RH positive was 84 % donors and Rh negative was 16%.

CONCLUSION

The current study deduces that the most common blood group is O and the least common is AB among the blood donors at Al-Bayda and EL-Marj cities in Libya. Blood group A (29.7%) occupies second place beyond O, followed by blood group B(25%). Concerning the Rh blood group system, the Rh-positive donor's proportion was 84.9% and the Rh-negative was 15.1%.

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CONFLICT OF INTEREST

The authors announced that they have no contending interests.

LIMITATIONS

We faced some halts in conducting this study such as the data of blood donors at Elmarj Blood Bank in 2020 was not available because of the blood bank move from the old site to the new place so didn't document any information about blood donation that year, in despite that, the new independent establishment has improvement in the services for blood donation in the city. Other else, the the majority of donors were male and very few females because some physiological condition makes female blood donation very small, based on that, if anyone studies blood group and its relation to gender, he should perform a survey and take random samples that must be equal.

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