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Distribution of ABO Blood Groups and Rhesus Factor in Derna, Libya

(Original Research Article)

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Abstract— ABO and Rhesus (Rh) blood group antigens are hereditary characters and are useful in population genetic studies, in resolving medico-legal issues and more importantly for the immunologic safety of blood during transfusion. This study is aimed to determine the distribution pattern of the ABO and Rh blood groups among population in Derna city/ Libya and compare it with other data from similar studies within Libya and all over the world. It is a retrospective study, was conducted on 772 blood donors, people who attended different health centers and private laboratories at Derna city. The study period was from January 1st 2018 to April 31st 2019. The subjects of both genders (aged between 18-65 years) were analyzed. Information regarding medical history, ages, sex was also obtained. Blood group was determined by forward and reverse grouping by conventional tube method. The age group and sex of the subjects, frequency of ABO and Rh blood groups were reported in simple percentages. Overall blood group- O was the highest (**39.50**%) and the second most frequent ABO blood groups was A (28.24 %), while the AB blood group was the

lowest (7.90 %). The prevalence of Rhesus positive and negative distribution in the studied population was 90.5% and 5.5% respectively. Blood group frequency with respect to ABO , Rhesus positive and Rhesus negative was found to be shown by formula O> A>B >AB. Knowledge of frequencies of the different blood groups is very important for blood banks and transfusion service policies that could contribute significantly to the National Health System**.**

Key Words: ABO Blood Group; Rh Blood Group; Frequencies.

Introduction

Human red blood cells contain on their surface a series of glycoproteins and glycolipids, which constitute blood group antigens. Development of these antigens are genetically controlled, inherited in a mandelian fashion and appear early in fetal life and remain unchanged till death [Firkin F 1989].

Nearly 700 erythrocyte antigens are described and organized into 30 blood group systems by the International Society of Blood Transfusion of which ABO and Rh are most important [Garraty G 2000].

The ABO blood group system was the first human blood group system to be discovered by Landsteiner in 1901[Garraty G 2000]. Later Landsteiner and Wiener defined the Rh blood group in 1941[Rahman M,2004]. Together these two systems have proved to be the most important, for blood transfusion purpose.

Discovery of ABO blood group system opened the way for discoveries in the field of immunohaematology, blood transfusion among humans irrespective of their natives, unmatched pregnancy, legal medicine, anthropology and the discovery of other blood group systems [Jolly J 2000].

The ABO blood group system is divided into four blood types on the basis of presence or absence of A and B surface antigens. The blood groups are A,B,O and AB. ABO blood group system is important because of the fact that A and B are strongly antigenic and anti A and anti B are naturally occurring antibodies present in the serum of persons lacking the corresponding antigen. These antibodies are capable of producing intravascular hemolysis in case of incompatible transfusion [Harmening MD,2005].

Rh antigens are highly immunogenic. Out of 49 Rh antigens identified till now, D antigen is most significant. D negative individuals produce anti-D if they encounter the D antigen through transfusion or pregnancy and causes hemolytic transfusion reaction, or hemolytic disease of fetus and newborn. For this reason, the Rh status is routinely determined in blood donors, transfusion recipients, and in mothers-to-be [Bethesda DL. 2005].

Apart from their importance in blood transfusion practice, the ABO and Rh blood groups are useful in clinical studies population genetic studies, researching population migration patterns as well as resolving certain medicolegal issues, particularly of disputed paternity cases [Khan MS,2004] .

All human populations share the same blood group systems; although they differ in the frequencies of specific types. The incidence of ABO and Rh groups varies markedly in different races, ethnic groups, and socio-economic groups in different part of the world [Sidhu S, et al. 1980].

Knowledge of availability of different Blood groups at various levels is need of the hour for more efficient delivery of blood bank services and so is the need of this study In the present study distribution of blood groups is studied in Derna City, Libya.

Materials and Methods

In this retrospective study, data of 772 blood donors, routine medical sampling for people who attended different health centers and private laboratories at Derna city were collected from their records. The study period was from January 1st 2018 to April 31st 2019. The subjects of both genders (aged between 18-65 years) were analysed. Information regarding medical history, ages, sex was also obtained. Blood group was determined by forward and reverse grouping by conventional tube method from the pilot samples, following the standard operative procedures.

For blood collection tube with EDTA, it inverted for 8 to 10 times to mix well with the anticoagulant. Blood samples were centrifuge at 1000 to 1500 rpm for 10 min. Erythrocytes were separated for the determination of blood type. For complete ABO grouping (forward and reverse) mono clonal anti A, anti B, anti AB antisera and A, B, O pooled cells were used. For Rh typing anti-D antisera were used. Final blood group was confirmed only if forward and reverse groups are identical. Rh negative blood groups were confirmed by antiglobulin technique. Data on frequency of ABO and Rh-D blood groups were reported in simple percentages and compared with the similar studies by other authors.

Data Analysis

Data were analyzed using the SPSS software version 20 (SPSS, Inc., Chicago, IL, USA). Descriptive statistics expressed as mean, standard deviation (SD) and the frequency with percentages were calculated for interval and categorical variables, respectively.

Results

During the period between January 1st 2018 to April 31st 2019, a total of 772 subjects were collected. Of these, there were blood donors, routine medical sampling for people who attended different health centers and private laboratories at Derna city. The overall average age of the subjects was (45 ± 21). Overall blood group- O was the highest (39.50%) and the second most frequent ABO blood groups was A (28.24 %), while the AB blood group was the lowest (7.90 %).

The distribution of ABO blood groups in both Rh(D) positive and negative subjects are illustrated in Table1and Fig 1, respectively. Amongst whom blood group O+ was found to be the most common type (34.5%), followed by groups A+ (25.6%), B+ (22.0%) and AB+ (7.3%), whereas amongst the Rh negative subjects, blood group O- was the most frequent (5.1%), followed by groups A- and B- (2.6%), (2.3%) respectively and AB− were the lowest frequency (0.6%).

Table (1): Overall Frequencies of ABO Blood Group with Rh

Blood group	Frequency	Percent %	Cumulative %
A-	20	2.6	2.6
A+	198	25.6	28.2
AB-	5	.6	28.9
AB+	56	7.3	36.1
B-	18	2.3	38.5
B+	170	22.0	60.5
O-	39	5.1	65.5
O+	266	34.5	100.0
Total	772	100.0	

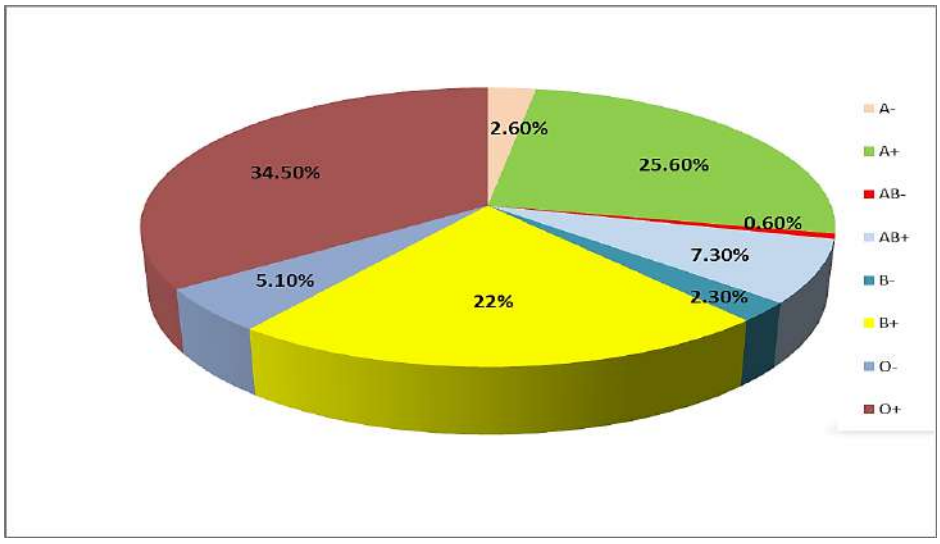

Figure (1): Overall Frequencies of ABO Blood Group with Rh.

According to the Rh system the Rh positive comprised (89.4%) and the Rh negative (10.6%) among participants as shown in figure (2).

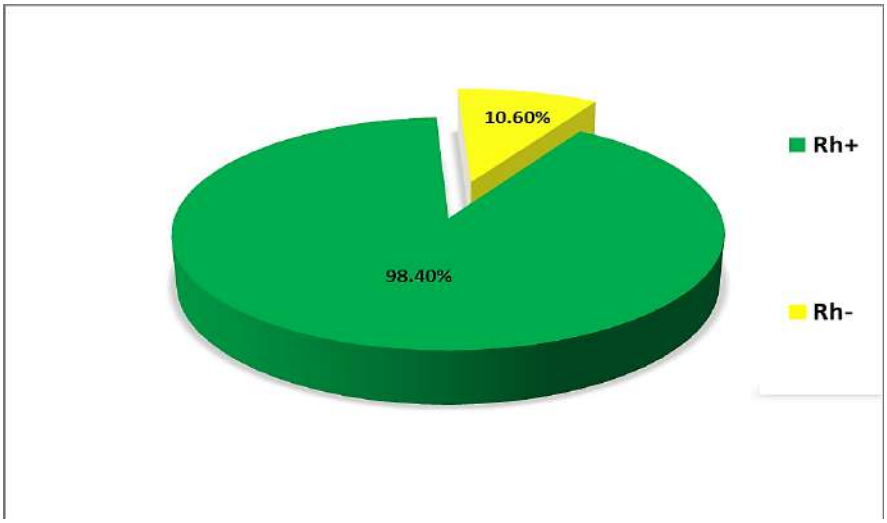

Figure (2): Overall Rh+,Rh- Distribution (2018-2019)

The distribution of Rh+and Rh- among males and females in derna city year (2018-2019) was similar as shown in table 2& 3, respectively**.**

Table (2): Rh+,Rh- Distribution among Males

Rh Type	Frequency	Percent %
Rh+	333	90.5
Rh-	35	9.5
Total	368	100

Table (3): Rh+,Rh- Distribution among Females

Rh Type	Frequency	Percent %
Rh+	357	88.4
Rh-	47	11.6
Total	404	100

RH blood group distribution according to ABO type in the year (2018-2019) was explained in Table:4.

Table 4. RH Blood Group Distribution according to ABO Type in the Year (2018-2019)

Rh Type	ABO Group			
	A	**AB**	**B**	**O**
RH+	198	56	170	266
within group%	90%	92%	90%	87%
RH-	20	5	18	39
within group%	10%	8%	10%	13%
Total	218	61	188	305

However, comparing the overall ABO blood group distribution in both Rh(D) positive and negative subjects are among males and females was similar in (O+, A+, B+ ,AB+, AB-) while was different in (A-,B-,O-) as shown in Figure 3.

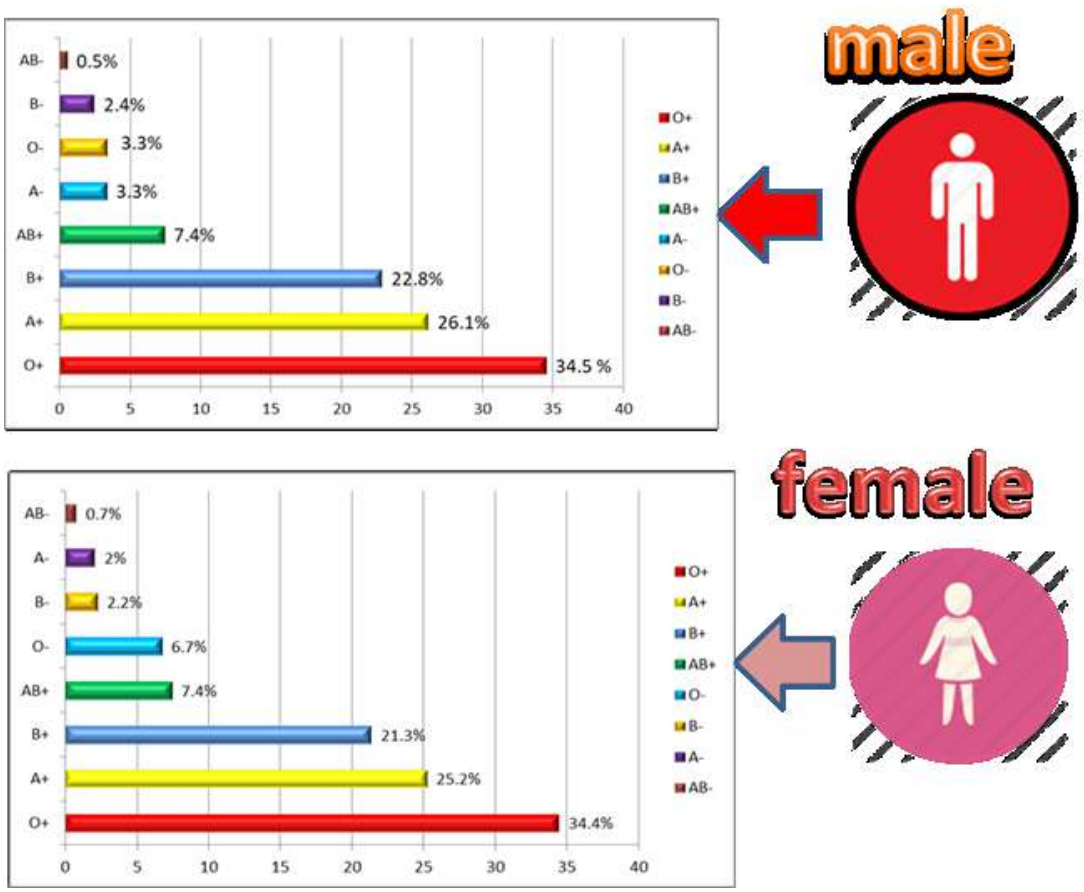

Figure (3): Distribution of ABO &Rh Blood Group Proportions Classified according to Gender.

Discussion

ABO and Rh genes and phenotypes vary widely across races and geographical boundaries [Dacie JV, Lewis SM.2001], despite the fact that the antigens involved are stable throughout life. The results of polymorphism remains important in population genetic studies, estimating the availability of compatible blood, evaluating the probability of haemolytic disease in the new born, resolving disputes in paternity/maternity and for forensic purposes [Bakare AA, 2006]. The present study is, therefore, useful in providing information on the status of ABO and Rh blood group distribution in Derna city / Libya.

Blood group-O was the predominant (**39.50**%) and AB was the least common (7.90%) blood group in both Rh(D) positive and negative subjects. Noor, F. and F.I.N. Eldin (2013), they studied the ABO frequency in western part of Libya and they found that the percentage of blood group O (48.9%) is the highest, followed by A(33.1%) and B (12.8%) [Noor, F. and F.I.N. Eldin (2013),] which is similar to frequency in this study.

A similar distribution of ABO blood groups to our study was found in West Bank, Saudi Arabia, Egypt, Sudan, Iraq, Libya and Kuwait. (Al-Bustan S,2002). However, other countries such as Syrian Arabs, Lebanon, Israel, Jordan and Tehran (Hanania S, 2007) have a different ABO spectrum in which blood group-A is the predominant.

Rh(D) positive individuals reported the highest percentage in this study and this is in agreement with previous studies (Hanania S, 2007, Kawakeb A. 2016). From our view point, this could have a significant implication to the major blood bank and hospitals in Derna city and ,where certain blood groups are needed more than others in emergency conditions. In addition, to give the chance for researchers to explore the reasons of increasing of one blood group to another by linked genetic influences and effects of inter and intra marriage.

Apart from transfusion service, knowledge of ABO and Rh blood groups are useful in population genetic studies, researching population migration patterns as well as resolving certain medicolegal issues particularly disputed parentage and preventive measures against the diseases which are associated with different blood groups. Studies concerned about possible association between ABO blood group and cardiovascular diseases have confirmed that persons of group A are affected more frequently with coronary heart disease, ischemic heart disease, venous thrombosis and atherosclerosis, while its low in people with blood group ‘O’.[Khan M I etal,2009] ‘O’ group individuals are known to have a 14 % reduced risk of squamous cell carcinoma and 4 % reduced risk of basal cell carcinoma when compared to non-O group [Xie J, etal 2010]. It is also associated with a reduced risk of pancreatic cancer [29,30]. The ‘B’ antigen is associated with increased risk of ovarian cancer [Gates M A et al

2010].Gastric cancer is more common in blood group 'A' and least in group 'O' [Aird I et al 2011].

Conclusion

Up-to-date knowledge of the distribution of blood types in a local setting is critical to the functioning of any national health service. Distribution of blood groups among the population in a specific geographic area helps for a good inventory management. The knowledge of frequencies and distribution of the different blood groups is very important for blood banks and transfusion services so that they could contribute significantly to the National health system to formulate the policy. Having knowledge of own blood group is important for everyone. It saves lives when transfusion is needed. This study will definitely helpful for blood banks management and blood donation in crisis. To date, there has been a lack of data on this important topic in Libya. Similar studies are needed across the country and further research and mobilization are required. The present study is original in that, it's the first comprehensive study that documented the frequency of ABO and Rh (D) blood groups in Derna city / Libya**.**There are some limitations to this study as it was conducted in the Derna city , the results should not be generalized to Libya as a whole.

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