Available online on 25.02.2023 at http://jddtonline.info

Journal of Drug Delivery and Therapeutics

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Research Article

Relation of ABO Blood Group on Fibrinogen Levels and Platelet Count in Apparently Healthy Sudanese Subjects at Khartoum state, 2022

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Article Info:

Article History:

Received 22 Dec 2022
Reviewed 29 Jan 2023
Accepted 07 Feb 2023
Published 25 Feb 2023

Cite this article as:

Mohammed HAA, Merghani MM, Babiker NE, Relation of ABO Blood Group on Fibrinogen Levels and Platelet Count in Apparently Healthy Sudanese Subjects at Khartoum state, 2022, Journal of Drug Delivery and Therapeutics. 2023; 13(2):80-85

DOI: http://dx.doi.org/10.22270/jddt.v13i2.5948

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Abstract

No diseases are known to result from the lack of expression of ABO blood group antigens, but the susceptibility to a number of diseases has been linked with a person's ABO phenotype. A cross sectional study conducted at research laboratory of Gharb El-Niel College from May to August 2022, to estimate the relation of ABO blood group on fibrinogen levels and platelet count in apparently healthy Sudanese subjects. For the **A** positive blood group there was significant decreased in the fibrinogen level when compared with the $\mathbf{B}^{+}$, $\mathbf{O}^{+}$ and $\mathbf{O}^{-}$ blood group, and in significant differences with the $\mathbf{AB}^{+}$ and $\mathbf{A}^{-}$. For the platelets counts; there was significant increased with $\mathbf{AB}^{+}$ and in significant differences with other blood groups, for the $\mathbf{B}^{+}$; there was significant decreased in the fibrinogen level when compared with other blood groups, however in the platelets count there was insignificant differences in all blood grouping except the $\mathbf{O}^{+}$. In addition, there was significant decreased in the fibrinogen level in $\mathbf{O}^{+}$ when compared with the $\mathbf{AB}^{+}$ and $\mathbf{A}^{-}$. $\mathbf{AB}^{+}$ when compared with the $\mathbf{O}^{-}$, and $\mathbf{A}^{-}$ when compared with $\mathbf{O}^{-}$. Regarding the platelets count there was significant differences when $\mathbf{O}^{+}$ blood group compared with $\mathbf{AB}^{+}$, and $\mathbf{AB}^{+}$ when compared with the $\mathbf{A}^{-}$ and $\mathbf{O}^{-}$. There were insignificant differences when the fibrinogen level and platelets count compared with the age and gender. Finally, there was a clear significant decreased in the fibrinogen levels and platelets count among the individuals with different **ABO** blood group.

Keywords: ABO blood group, fibrinogen, platelets, phenotype, coagulometer.

INTRODUCTION

At the beginning of the 20th century an Austrian scientist, Karl Landsteiner, noted that the RBCs of some individuals were agglutinated by the serum from other individuals. He made a note of the patterns of agglutination and showed that blood could be divided into groups. This marked the discovery of the first blood group system, ABO, and earned Landsteiner a Nobel Prize. Landsteiner explained that the reactions between the RBCs and serum were related to the presence of markers (antigens) on the RBCs and antibodies in the serum. Agglutination occurred when the RBC antigens were bound by the antibodies in the serum. He called the antigens A and B, and depending upon which antigen the RBC expressed, blood either belonged to blood group A or blood group B. A third blood group contained RBCs that reacted as if they lacked the properties of A and B, and this group was later called "O" after the German word "Ohne", which means "without". The following year the fourth blood group, AB, was added to the ABO blood group system. These RBCs expressed both A and B antigens. [1]

No diseases are known to result from the lack of expression of ABO blood group antigens, but the susceptibility to a number of diseases has been linked with a person's ABO phenotype. Such correlations remain controversial and include the observation that gastric cancer appears to be more common in group A individuals, whereas gastric and duodenal ulcers occur more often in group O individuals.[2,3] A clear correlation has been established between the ABO phenotype and the level of two proteins involved in blood clotting; factor VII (FVIII) and von Willebrand factor (vWF) blood group O individuals have about 25% less FVIII and vWF in their plasma. It is well established that low levels of FVIII and vWF are a cause of excess bleeding, and therefore it may also be the case that increased levels make clotting more likely, increasing the risk of both arterial (ischemic heart disease) and venous (thromboembolic disease) problems. Indeed, non-group O individuals have been shown to be at an increased risk of both arterial and venous disease. [4] In the Sudan there is no publish data regarding the study of relation between the ABO blood system, fibrinogen level and palettes count, therefore this study was design to estimate the relation of ABO blood group on the fibrinogen levels and platelet count in apparently healthy Sudanese subjects.

MATERIAL AND METHODS

This study was descriptive cross sectional study conducted in research laboratory at Gharb El-Niel College during the period from May 2022 to August 2022, hundred veins blood samples were collected from the apparently healthy participants with

different age groups and gender. Five ml of the Blood was collected from the superficial vein in the antecubital fossa from the participants under sterile condition in trisodium citrate container and EDTA containers

Individuals who were included in this study were notified about the objectives of this study and its importance. The study was approved by the Scientific and ethical committee of Garb Alneil College and Federal Ministry of Health. Data was collected by using a structured data questionnaire consisting of basic demographic data, Clinical and Lab Data. Fibrinogen level was estimated by BioMed-Fibrinogen kite. the platelets count by the blood cells counter (Sysmex KX-21N).

RESULTS

In the present study 100 apparently healthy participants were included, 68% were males, 32% were females, 78% their age less than 30 years and 22% more than 30 years. The frequency of the blood group 25% were B^+ , 25% were AB^+ , 21% were O^+ , 20% were A^- , 5% , and 4 % O^-(table1, 2,3) (figure 1,2,3)

Table (1): Distribution of gender

Gender	Frequency	Percent
Male	68	68.0
Female	32	32.0
Total	100	100.0

Table (2): Distribution of age

Age	Frequency	Percent
< 30 years	78	78.0
≥ 30 years	22	22.0
Total	100	100.0

Table (3): Distribution of blood group

Blood group	Frequency	Percent
A positive	20	20.0
B positive	25	25.0
O positive	21	21.0
AB positive	25	25.0
A negative	5	5.0
O negative	4	4.0
Total	100	100.0

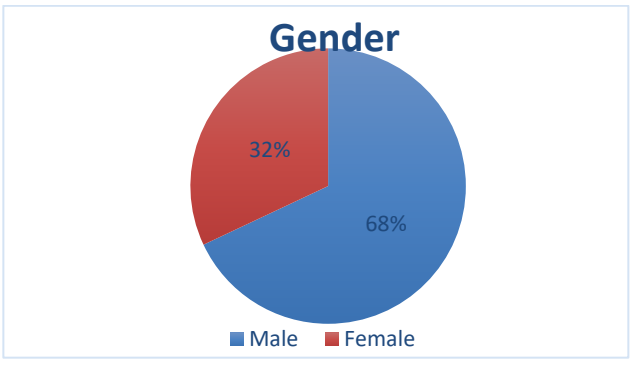

Figure (1) Distribution of gender

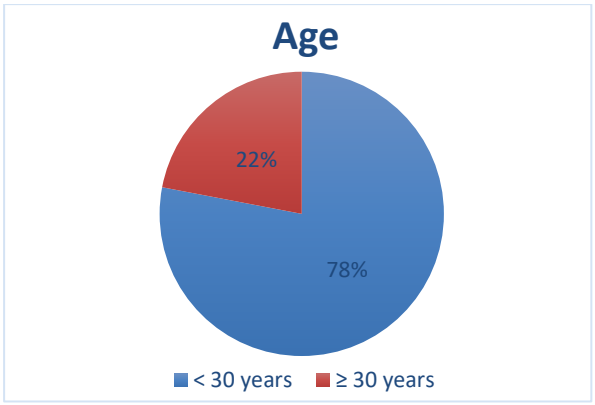

Figure (2): Distribution of age

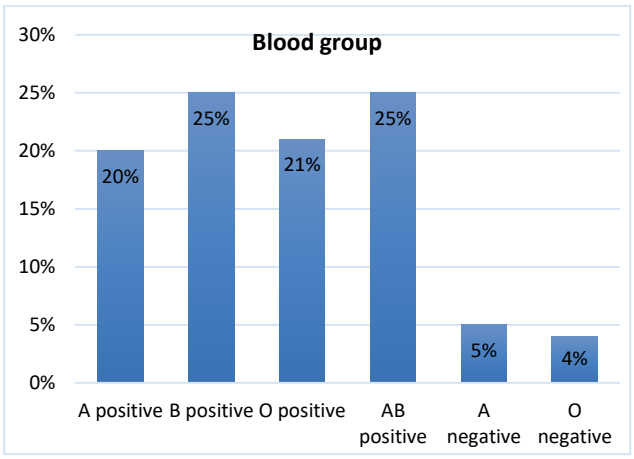

Figure (3): Distribution of blood group

The Hematological Results

The results of the present study revealed that; for the A positive blood group there was significant decreased in the fibrinogen level when compared with the B positive, O positive and O negative blood group (p value ≤0.05) , and in significant differences with the AB positive and A negative blood group (p value ≥0.05) . For the platelets counts; there was significant increased only with the AB positive blood group (p value ≤0.05) and in significant differences with the other blood group (p value ≥0.05)

Also for the B positive blood group; there was significant decreased in the fibrinogen level when compared with the other blood group (p value ≤0.05), however in the platelets count there was insignificant differences in the all blood grouping except the O positive blood group (p value ≥0.05)

In addition, there was significant decreased in the fibrinogen level in O positive when compared with the AB positive and A negative, AB positive when compared with the O negative, and A negative when compared with the O negative (p value ≤0.05).

Regarding the platelets count there was significant differences when O positive blood group compared with the AB positive, and AB positive when compared with the A negative and O negative (p value ≤0.05). (table4,5)

Generally, there was insignificant differences when the fibrinogen level and platelets count compared with the age and gender (p value ≤0.05) (table 6,7)

For the correlation results; there was significant correlation when the fibrinogen level correlate with the platelets count, and in significant correlation when fibrinogen level and platelets count correlated with the age. (Table 8, 9) (figure 4)

Table (4): Multiple Comparisons of fibrinogen according to blood group

Blood group (I)	Blood group (II)	Mean of fibrinogen (I)	Mean of fibrinogen (II)	P. value
A positive	B positive	249.8 ± 44.6	216.0 ± 24.7	0.001*
	O positive		165.0 ± 16.3	0.000*
	AB positive		239.1 ± 46.3	0.226
	A negative		255.0 ± 54.9	0.889
	O negative		163.0 ± 25.5	0.000*
B positive	O positive	216.0 ± 24.7	165.0 ± 16.3	0.000*
	AB positive		239.1 ± 46.3	0.026*
	A negative		255.0 ± 54.9	0.029*
	O negative		163.0 ± 25.5	0.007*
O positive	AB positive	165.0 ± 16.3	239.1 ± 46.3	0.000*
	A negative		255.0 ± 54.9	0.000*
	O negative		163.0 ± 25.5	0.919
AB positive	A negative	239.1 ± 46.3	239.1 ± 46.3	0.370
	O negative		255.0 ± 54.9	0.000*
A negative	O negative	255.0 ± 54.9	163.0 ± 25.5	0.000*

Table (5): Multiple Comparisons of platelet count according to blood group

Blood group (I)	Blood group (II)	Mean of platelet count (I)	Mean of platelet count (II)	P. value
A positive	B positive	263.9 ± 97.6	298.0 ± 39.9	0.109
	O positive		237.5 ± 84.9	0.233
	AB positive		321.6 ± 56.8	0.007*
	A negative		245.6 ± 63.1	0.605
	O negative		237.0 ± 52.4	0.488
B positive	O positive	298.0 ± 39.9	237.5 ± 84.9	0.005*
	AB positive		321.6 ± 56.8	0.238
	A negative		245.6 ± 63.1	0.132
	O negative		237.0 ± 52.4	0.111
O positive	AB positive	237.5 ± 84.9	321.6 ± 56.8	0.000*
	A negative		245.6 ± 63.1	0.817
	O negative		237.0 ± 52.4	0.990
AB positive	A negative	321.6 ± 56.8	245.6 ± 63.1	0.030*
	O negative		237.0 ± 52.4	0.028*
A negative	O negative	245.6 ± 63.1	237.0 ± 52.4	0.856

Table (6): Comparison of fibrinogen and platelet count according to gender

	Gender		P. value
	Male (n=68)	Female (n=32)	
Fibrinogen	216.4 ± 50.3	220.4 ± 45.0	0.700
Platelet Count	273.3 ± 77.6	292.2 ± 72.3	0.248

Table (7): Comparison of fibrinogen and platelet count according to age

	Age		P. value
	< 30 years(n=78)	≥ 30 years(n=22)	
Fibrinogen	215.0 ± 50.7	227.1 ± 39.0	0.306
Platelet Count	274.6 ± 79.6	296.0 ± 60.5	0.246

Table (8): Correlations of age with fibrinogen and platelet count

		Age
Fibrinogen	Pearson Correlation	.128
	P. value	.204
Platelet Count	Pearson Correlation	.118
	P. value	.241

Table (9): **Correlations of fibrinogen with platelet count**

		Platelet Count
Fibrinogen	Pearson Correlation	.274**
	P. value	.006

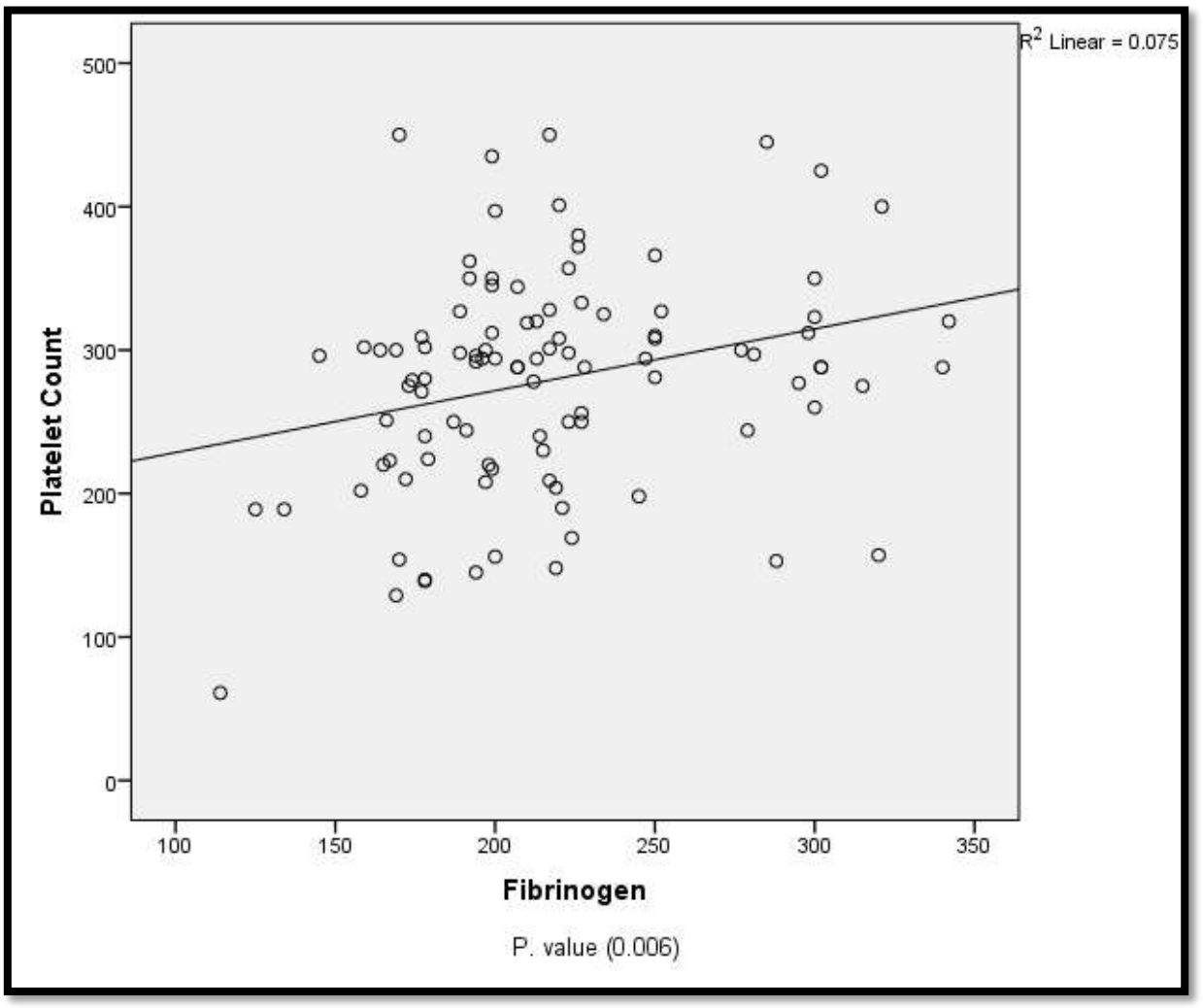

Figure (4): Correlations of fibrinogen with platelet count

DISCUSSION

Numerous reports have suggested important associations between ABO blood groups and various diseases, for example, gastric cancer, periodontal diseases, cardio metabolic diseases and bleeding disorders. [5,6,7] This is a cross sectional study designed to estimate the fibrinogen level and platelet count in Sudanese subjects of different ABO blood groups. A total of 100 apparently healthy participants were included, 68% were males, 32% were females, 78% their age less than 30 years and 22% more than 30 years. The frequency of the blood group 25% were B^+, 25% were AB^+, 21% were O^+, 20% were A^-, 5% , and 4 % O^-

The frequency of the ABO blood groups varies among different populations in the world with the highest frequency of the A phenotype found mainly in Northern and Central Europe, B phenotype in Central Asia while Blood Group O is the most frequent phenotype globally, with parts of Africa and Australia showing highest frequencies.[8]

The results of the present study revealed that; for the A positive blood group there was significant decreased in the fibrinogen level when compared with the B positive, O positive and O negative blood group, and in significant differences with the AB positive and A negative blood group. For the platelets counts; there was significant increased only with the AB positive blood group and in significant differences with the other blood group. This results of this study disagree with Okeke and Iloka et al which found; The mean platelet count was found to be significantly lower in individuals of blood group O than in individuals of A blood group. Though in comparison to the reference range in literature (150 to 400 × 109/l) the levels were normal in this study, this may be suggestive of a likelihood of thrombocytopenia in individuals of O blood group than A blood group. Several studies have shown increased risk of thrombosis in individuals belonging to the non-O (A, B and AB) blood type. [5,9]

Also in this study the fibrinogen level was significantly deceased in the B positive blood group, when compared with the other blood group. In addition, there was significant decreased in the fibrinogen level in O positive when compared with the AB positive and A negative, AB positive when compared with the O negative, and A negative when compared with the O negative. This finding agree with Kristoffer Korsan-Bengtsen et al which said ; Fibrinolytic activity varied significantly in the AB0 system, and the Fibrinogen values varied significantly within the Rh groups.[10]

And disagree with Okeke and Iloka et al which reported; Our finding showed no statistically significant difference in the mean level of plasma fibrinogen when compared among the participants of different ABO blood groups. [5] However Jimenez, et al. documented a higher plasma fibrinogen level in the patients with blood group AB than in those with blood groups A,

B and O.[11]

Regarding the platelets count there was significant differences when O positive blood group compared with the AB positive, and AB positive when compared with the A negative and O negative.

The finding of this study however is in contrast with the report of Ajayi, et al. who observed that blood group AB had significantly higher values of Platelet counts when compared with other blood groups. Aside the significant difference obtained between blood group O and A, there

Another study mention that; no significant differences in the mean platelet count when compared between individuals of the other blood groups. This is in consonance with the findings of a previous study that reported no significant differences in the mean platelet count between the different ABO blood groups. [12,13]

In the present study there was insignificant differences when the fibrinogen level and platelets count compared with the age and gender. this similar Okeke and Iloka et al result which showed no significant differences in the mean level of both fibrinogen and platelet count in male and female participants of different ABO blood groups studied. This confirms that gender differences do not alter the levels of platelet count and fibrinogen level in individuals of different

ABO blood group. This finding is corroborated by the results of similar studies. [5,14,15]

For the correlation results; there was significant correlation when the fibrinogen level correlate with the platelets count, and in significant correlation when fibrinogen level and platelets count correlated with the age.

This supports an earlier study by Aliberti, et al. which found that plasma fibrinogen level was significantly correlated with the Platelet count. However, Okeke and Iloka et al found insignificant correlations observed between platelet count and plasma fibrinogen level in individuals of the ABO blood groups (AB, B and O) and significant correlation in individuals of A blood group only. [5,16]

CONCLUSION

In the conclusion there was a clear significant decreased in the fibrinogen levels and platelets count among the individuals with different ABO blood group, furthermore; more studies with large sample size from the different places and different tribes in Sudan are needed to adopting this results.

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