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Compare Different Blood Parameters Between Different Types of Cathete in Atherosclerosis Patients with Type 2 Diabetus

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Abstract

Human blood groups ABO (BG) represent an important system in blood transfusion medicine and transplantation, and have a role in the development of heart disease. The current study was conducted with the aim of comparing the types of blood groups and knowing the most affected by atherosclerosis and type 2 diabetes. Our study was consisted of total (n=192) population with age range (45-70) years old and overweight in terms of their BMI. The first group included (n=64) under **Precautinous coronary intervention (PCI)** catheterization with atherosclerosis and diabetes type 2. The second group (n=64) underwent **Diagnostic (DIG) catheterization** with diabetes type 2 and without atherosclerosis.

The association between blood group types with diabetes type 2 disease and atherosclerosis was investigated. The most prevalent blood group was O^+ (93.74%) in DIG, (80.84%) in PCI closely followed by group B (49.99%), (44.62%) in DIG and PCI respectively, and group A (43.75%) In both group. Least prevalent blood group was AB (35.25%) in PCI and (12.5%) in DIG group. In conclusion the patients with type O are more likely to have diabetes and atherosclerosis, and those with type B are more likely to develop diabetes. Type A and AB are less likely to develop sclerosis.

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1. Introduction

Cardiovascular disease is the most common cause of death in developed countries and is rapidly spreading in developing countries [1]. It is the major cause of death all over the world; there are many risk factors that contribute to increase cardiovascular disease, such as aging, gender, dyslipidemia, hypertension and diabetes, smoking, and family history [2]. The ABO system is the most important blood group system in human blood transfusion [3]. This system encompasses type A and type B red blood cell antigens. Their absence or presence relies on three separate alleles (A, B, O) at one genetic site. Anti-A and Anti-B, ABO antibodies common in the early years of life are produced by sensitizing to environmental materials such as food, bacteria, and viruses [4].

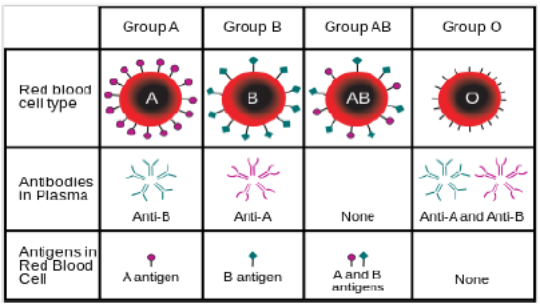

Figure 1. Relation between blood types with antigen and antibody [4].

The most polymorphic of human blood groups is the Rh blood group system, consisting of at least 45 independent antigens, and in addition to ABO, it is considered the most clinically important in blood transfusion medicine. There are two types of blood type Rh. Negative and positive. These two different types depend on the presence or absence of antigen D [5]. The commonness of a blood group in a geographical area or a community can affect the incidence of certain diseases [6]. Previous studies showed that the relation of ABO blood

groups and ischemic heart disease in Italy, Iran and India [7,8]. Cardiovascular diseases in particular have been associated with ABO blood types and various diseases. Genome-Wide Association (GWAS), ABO has identified blood groups as the site of clotting and myocardial infarction, there are multiple vital indicators of risk for cardiovascular disease, and attract attention on the mechanisms and potentials of clinical progress [9]. To our knowledge, there is no recent published study available on this topic among the general population in Iraq. Thus, the aim of the present study is to investigate whether the ABO blood groups most affected by atherosclerosis associated with type 2 diabetes who undergo catheterization in Iraqi patients.

2. Materials and Methods

The study included 128 patients male and female with atherosclerosis type 2 diabetic mellitus (T2DM); 64 of them underwent precautious coronary intervention catheterization (PCI) and 64 underwent diagnostic catheterization (DIG) in addition to 64 healthy volunteers matched for age ranged between 45-70 years and gender (male and female) as a control group were involved in the present study. All samples were collected from patients attending to department of Clinical chemistry/Coronary care unit and Catheterization unit in Al-Sheikh Zayed and Ibn Al-Nafees Hospital in Baghdad, from June 2017 until January 2018. Each group contains 32 male and 32 female individuals. Patients who have had chronic renal failure, peripheral atherosclerosis and chronic inflamentery as well as smoking or alcohol drinking were excluded from the study. The Ethics-Committee of the College of Science / University of Baghdad has approved the protocol of this study. The ABO blood type was measured by the absence or presence of antigens A and/or B on the surface of the red blood cells in the serum [10]. Blood collecting by using commercial kit manufactured by (Article Medical). And the blood group was determined immediately after A clean white glass plate has been used by dropping three drops of blood on it. Each drop was mix with a drop of specific antibody in the kit using a woody stick, the first drop was mix with antibody A, the second was mixed with antibody B and the last one was Mixed with antibody Rh, as shown in Figure 2.

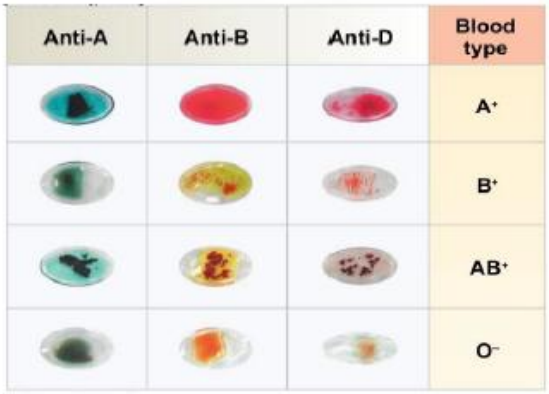

Figure 2. The Blood types [11].

Blood clinical biomarkers in each case study were determined by detecting the levels of complete blood count (CBC). These parameters were determined by using Ruby hematology Abbott analyzer/Germany.

3. Statistical Analysis

The statistical analysis was carried out by using the program Statistical Package for the Social Science (SPSS version 23.0). ANOVA test was used to show the differences between variables of differentiated groups. P-value less that 0.05 was considered significant.

4. Results and Discussion

The subjects of this study divided into subgroups, according to gender, blood type, Rh blood type, the Demographic characteristics in three groups as shown in the Table 1.

Table 1. Demographic characteristics in three groups.

Parameter	Mean ± SE			P-value
	PCI catheterization	DIG catheterization	C	
Age(year)	58.32 ± 0.78	58.39 ± 0.83	56.43 ± 0.81	0.135
BMI (kg/m^2)	27.81 ± 0.23	28.03±0.19	27.85±0.23	0.786
Circumference (cm)	102.62 ± 1.60	106.08 ±1.50	101.81 ± 2.00	0.182
Hip Circumference (cm)	102.62 ± 1.60	106.08 ±1.50	101.81 ± 2.00	0.182
WHR (cm)	0.96 ± 0.01	0.97 ±0.01	0.95 ± 0.02	0.646
WHtR (cm)	0.59 ±0.01	0.62±0.01	0.58±0.01	0.093
Waist (m)	98.69 ± 1.68	103.29 ± 1.51	98.55 ± 3.13	0.226
Heart rate (beat / minute)	80.00 ±1.41	81.79 ±1.54	79.77 ± 1.38	0.546

NS: No-significant, Sig: significant, WHR (waist to Hip ratio), WHtR (waist to height ratio), SE: standard error.

It is clear that there is no significant difference in the Demographic characteristics parameters among three groups.

Table 2. Distribution of sample study according to blood group.

Group and gender	BLOOD GROUP				Total	P-value
Control	**A^+(N%)**	**B^+(N%)**	**AB^+(N%)**	**O^+(N%)**		
Male	6 (19.35%)	17(54.83%)	0(%)	8(25.80%)	31	0.0001 **
Female	7(21.87%)	14(43.75%)	4(12.5%)	7(21.87%)	32	0.0001 **
%	41.22	98.58	12.5	47.67		
DIG						
Male	8(25%)	7(21.87%)	4(12.5%)	13(40.62 %)	32	0.0002 **
Female	6(18.75%)	9(28.12%)	0(%)	17(53.12 %)	32	0.0001 **
%	43.75	49.99	12.5	93.74		
PCI						
Male	6(18.75%)	11(34.37%)	8(25%)	7(21.87%)	32	0.0068 **
Female	8(25%)	4(10.25%)	4(10.25%)	23 (58.97%)	39	0.0001 **
%	43.75	44.62	35.25	80.84		

NS: Non-significant, ** (P<0.01) significant.

As it was shown in the Table 2, there were significant difference between blood group in patients under PCI and DIG.

Table 3. Compare between difference group in WBC and differential Of WBC.

Group	Mean ± SEM						
	WBC ($\times10^9$/L)	**Neutrophil (%)**	**Lymphocyte (%)**	**Neutrophil-lymphocyte ratio(N/L)**	**Monocyte (%)**	**Eosinophil (%)**	**Basophile (%)**
PCI	8.87 ± 0.36	4.86 ± 0.26	3.01 ± 0.12	1.78±0.15	0.58 ± 0.04	0.31 ± 0.07	0.10 ± 0.01
DIG	8.64 ± 0.51	4.70 ± 0.29	3.15 ± 0.31	1.66±0.22	0.50 ± 0.05	0.11 ± 0.03	0.09 ± 0.02
C	7.53 ± 0.41	4.55 ± 0.34	2.31± 0.19	2.23±0.16	0.52 ± 0.03	0.25 ± 0.07	0.07 ± 0.01
LSD value	1.244 *	0.868	0.613 *	0.086*	0.122	0.181	0.0242 *
P-value	0.050	0.769	0.016	0.045	0.452	0.456	0.027

NS: Non-significant, ** (P<0.01) significant, LSD: low significant difference.

As shown in the Table 3, white blood cell, Lymphocyte showed significant difference between subgroup PCI, DIG and C (p = 0.050), while no significant difference were shown when compare the number of Neutrophil, Monocyte and Eosinophil between PCI, DIG and control group.

On the other hand compare between difference groups in some blood of parameters as listed in Table 4, it was noticed that there was moderately significant increase in the values of platelet (PLT) in PCI when we compare them to that of the control group.

Table 4. Comparison in blood parameters between PCI, DIG and Control.

Group	Mean ± SE							
	RBC ($\times10^6$/µl)	**Hb (g/dl)**	**HCT (%)**	**MCV (fL)**	**MCH (pg)**	**MCHC (g/dl)**	**RDW (%)**	**PLT ($\times10^9$/l)**
PCI	4.89 ± 0.12	13.01 ± 0.42	41.43 ± 1.01	84.94 ± 1.34	26.65 ± 0.69	31.29 ± 0.43	11.90 ± 0.44	253.00 ± 13.95
DIG	4.69 ± 0.08	13.02 ± 0.31	40.66 ± 0.68	86.66 ± 1.16	27.74 ± 0.62	31.98 ± 0.37	11.41 ± 0.22	237.08 ± 15.04
C	4.72 ± 0.10	12.91 ± 0.49	40.37 ± 1.14	85.81 ± 1.82	27.22 ± 0.87	32.49 ± 0.57	11.27 ± 0.18	215.13 ± 10.13
LSD value	0.304	1.236	2.856	0.737	2.175	1.383	0.863	36.705 *
P-value	0.392	0.976	0.736	4.305	0.623	0.615	0.298	0.050

RBC: Red blood cell, Hb: Hemoglobin, HCT: Hematocrit, MCV: mean corpuscular value, MCH: mean corpuscular hemoglobin, MCHC: mean corpuscular hemoglobin concentration, RDW: Red cell distribution width, PLT: platelet.

Table 5 represents the comparision between blood group and different laboratory parameters. It was observed that there was a significant difference between blood groups regarding WBC, Neutrophile, Lymphocyte, Basophile (p = 0.0001, 0.048, 0.003, 0.002, respectively). Meanwhile, there was no significant difference in terms of Monocyte, Eosinophile, Red blood cell and Hemoglobin.

Table 5. Compare between Blood group and different Laboratory parameters as (mean ± SE).

Parameters	Mean ± SE				P-value
	A^+	AB^+	B^+	O^+	
WBC(×109/L)	7.29 ± 0.46	9.05 ± 0.52	7.11 ± 0.42	9.49 ± 0.39	0.0001**
Neutrophile (%)	4.20 ± 0.31	4.45 ± 0.55	4.29 ± 0.37	5.18 ± 0.23	0.048 *
Lymphocyte (%)	2.30 ± 0.21	2.79 ± 0.14	2.29 ± 0.21	3.24 ± 0.21	0.003 **
Monocyte (%)	0.517 ± 0.03	0.606 ± 0.07	0.469 ± 0.03	0.629 ± 0.06	0.074
Eosinophile (%)	0.184 ± 0.03	0.228 ± 0.03	0.172 ± 0.04	0.335 ± 0.07	0.166
Basophile (%)	0.071 ± 0.01	0.089 ± 0.01	0.065 ± 0.01	0.104 ± 0.01	0.002 **
RBC (×106/µl)	4.75 ± 0.18	5.04 ± 0.16	4.78 ± 0.12	4.72 ± 0.09	0.442
Hb (g/dl)	12.99 ± 0.61	13.46 ± 0.51	12.94 ± 0.35	12.77 ± 0.42	0.819
HCT (%)	41.12 ±1.50	42.92 ±1.26	40.53 ±0.87	40.62 ±0.95	0.578
MCV(fL)	86.71 ±1.29	86.91 ±0.85	85.45 ±1.66	85.57 ±1.45	0.917
MCH (pg)	27.47 ±0.76	27.86 ±0.33	27.18 ±0.75	26.98 ±0.74	0.914
MCHC (g/dl)	31.64 ±0.59	32.33 ±0.35	31.66 ±0.43	31.36±0.45	0.701
RDW (%)	12.07 ±0.64	11.73 ±0.58	11.18 ±0.20	11.39 ±0.19	0.312
PLT (×109/l)	223.81 ±18.0	219.89 ±7.84	205.77 ±10.1	255.16 ±12.8	0.024 *
MPV (%)	23.14 ±11.34	6.41 ±0.35	15.91 ±9.13	9.17 ±2.46	0.492

* (P<0.05), ** (P<0.01), NS: Non-Significant.

5. Discussion

The most important finding of the current study is the relationship of blood groups and the extent of atherosclerosis associated with type 2 diabetes in Iraqi patients who underwent catheter examination of both types. This study is considered a first prospective, and to our knowledge. Our result agrees with Whincup et al., 1990 [12], who reported that individuals who have blood type O exposed more than other blood types to heart and hypertension, the disease that related to PCI. Physicians can benefit from the results of this research for early diagnosis diabetes mellitus by paying more attention to subjects having more susceptible blood group and advise them to adopt a healthy lifestyle to decrease the risk of getting diabetes [13].

Several studies have found a significant difference between acute coronary events and ABO, particularly sudden cardiac death and acute myocardial infarction [14, 15, 16]. Our study reinforced the hypothesis that type 2 DM is associated with blood groups in terms of the broad genetic immunologic basis in both. It was found that the frequency of O and B blood groups is significantly lower and higher, respectively, in type 2 DM patients [17]. Theoretically, ABO blood group can alter the rate of von Willebrand factor (vWF) synthesis or secretion within endothelial cells. Additionally, ABO group may affect vWF plasma clearance rates. ABH antigenic determinants have been identified on the N-linked oligosaccharide chains of circulating vWF and FVIII, according to the blood group of the individual. Previous studies have shown controversial findings on the relationship between ABO blood groups and cardiomyopathy in Italy, Iran, and India [17, 18, 19, 20, 21].

The results of the present study disagrees with some studies which concluded that there was an association between type 2 DM and A and O blood groups, while subjects with blood group B had higher incidences of type 2 DM and hence were at higher risk of getting type 2 DM [22]. These controversies between the association of blood group and atherosclerosis can be due to several confounding factors like, hypertension, smoking and diabetes mellitus. Meanwhile, the environmental, socioeconomic condition and a life style may have some effect on ABO and atherosclerosis.

Our study agrees with a study by Sujirachato et al., which argued that patients, especially women, with coronary atherosclerosis and blood group O had increased sudden cardiac deaths. [23, 24]. The limitation of this study, are needed to enhance the relationships by a prospective, larger population studies.

6. Conclusion

Through this study, it was explained that ABO blood group had an effect on the risk of arteriosclerosis with type 2 DM. It was found that Atherosclerosis and type 2 diabetes in individuals with blood type O while other blood groups B, A and AB had lower incidences of these diseases respectively, on the other hand, the effects of the blood group extend to include the severity of arteriosclerosis and type 2 diabetes.

Reference

[1] Zhang, H.; Mooney, C. J.; Reilly and M. P.; "ABO blood groups and cardiovascular diseases"; [Electronic version] Int. J. Vascular Med., 46-55, 2012.

[2] Califf, R. M.; Armstrong, P. W.; Carver, J. R.; D'Agostino R. B. and Strauss, W. E.; "Matching the intensity of risk factor management with the hazard for coronary disease events. Task Force 5. Stratification of patients into high, medium and low risk subgroups for purposes of risk factor management", J. Am. Coll. Cardiol., 27(5), 1007-19, 1996.

[3] Ignatius, C. M.; Emeka, E. and Neboh, S. A. U.; "The relationship between serum cortisol, adrenaline, blood glucose and lipid profile of undergraduate students under examination stress", African Health Sci., 15, 131-136, 2015.

[4] Daniels, G. L.; Fletcher, A.; Garratty, G.; Henry, S.; Jorgensen, J.; Judd, W. J.; Levene, C.; Lomas, F. C.; Moulds, J. J.; Moulds, J. M.; Moulds, M. and Overbeeke, M.; "International Society of Blood Transfusion. Blood group terminology, from the International Society of Blood Transfusion committee on terminology for red cell surface antigens"; Vox Sanguinis, 87, 304-316, 2004.

[5] Avent, N. D. and Reid, M. E.; "The Rh blood group system: a review", Blood, 95 (2), 375 – 387, 2000.

[6] Sari, I.; Ozer, O.; Davutoglu, V.; Gorgulu, S.; Eren, M. and Aksoy, M.; "ABO blood group distribution and major cardiovascular risk factors in patients with acute myocardial infarction" Blood Coagul Fibrinolysis; 19(3), 231-4, 2008.

[7] Carpeggiani, C.; Coceani, M.; Landi,P.; Michelassi, C. and L'abbate, A.; "ABO blood group alleles: A risk factor for coronary artery disease. An angiographic study"; Atherosclerosis, 211(2), 461-6, 2010.

[8] Amirzadegan, A.; Salarifar, M.; Sadeghian, S.; Davoodi, G.; Darabian, C. and Goodarzynejad, H.; "Correlation between ABO blood groups, major risk factors, and coronary artery disease". Int. J. Cardiol., 110(2), 256-8, 2006.

[9] Garrison, R. J.; Havlik, R. J.; Harris, R. B.; Feinleib, M.; Kannel, W. B. and Padgett,S. J.; "ABO blood group and cardiovascular disease the Framingham study"; Atherosclerosis 25(2-3), 311–318, 1976.

[10] Andersson, M.; Carlin, N.; Leontein, K.; Lindquist, U. and Slettengren, K.; "Structural studies of the oantigenic olysaccharide of Escherichia coli O86, which possesses blood-group B activity", Carbohydrate Res., 185, 211- 223, 1989.

[11] Aspinall, G. O.; Monteiro, M. A.; "Lipopolysaccharides of Helicobacter pylori strains p466 and MO19: structures of the O antigen and core oligosaccharide regions", Biochemistry, 35 (7), 2498-2504, 2008.

[12] Whincup, P. H.; Cook, D. G.; Phillips, A. N.; Shaper, A. G.;"ABO blood group and ischaemic heart disease in British men", Biomed. J., 300, 1679-1682, 1990.

[13] Sloop, G. D. and Garber, D. W.; "The effects of low-density lipoprotein and high-density lipoprotein on blood viscosity correlate with their association with risk of atherosclerosis in humans", Clin. Sci. (Lond), 92, 473-479, 1997.

[14] Rupali, T.; Warghat, N.; Sharma, N.; Wankhade, A. and Baig, M.; "Gene diversity among some endogamous population of Amravati district, Maharashtra", India Asiatic J. Biotech. Resources, 2 (5), 558-567, 2011.

[15] Gogri, H.; Ray, S.; Agrawal, S.; Aruna, S.; Ghosh, K. and Gorakshakar, A.; "Heterogeneity of O blood group in India: Peeping through the window of molecular biology", Asian J. Transfusion Sci., 12(1), 63, 2018.

[16] Dikmenoğlu, N.; Ciftçi, B.; Ileri, E.; Güven, S. F.; Seringeç, N.; Aksoy, Y. and Ercil, D.; "Erythrocyte deformability, plasma viscosity and oxidative status in patients with severe obstructive sleep apnea syndrome", Sleep Med., 7, 255-261, 2006.

[17] De Simone, G.; Devereux, R. B.; Chien, S.; Alderman, M. H.; Atlas, S. A. and Laragh, J. H.; "Relation of blood viscosity to demographic and physiologic variables and to cardiovascular risk factors in apparently normal adults", Circulation, 81, 107-117, 1990.

[18] Qureshi, M. A. and Bhatti, R.; "Frequency of abo blood groups among the diabetes mellitus type 2 patients", J. College of Phys. and Surgeons Pakistan, 13(8), 453–455, 2003.

[19] Lee, H. F.; Lin,Y. C.; Lin, C. P.; Wang, C. L.; Chang, C. J. and Hsu, L. A.; "Association of blood group A with coronary artery disease in young adults in Taiwan", Internal Medicine, 51(14), 1815–1820, 2012.

[20] Von Beckerath, N.; Koch, W. ad Mehilli, J.; "ABO locus O1 allele and risk of myocardial infarction," Blood Coagulation &Fibrinolysis, 15(1), 61–67, 2004.

[21] Mitchell, J. R. A.; "An association between abo blood-group distribution and geographical differences in death-rates", The Lancet, 309(8006), 295–297, 1977.

[22] O'Donnell, J. and Laffan, M. A.; "The relationship between ABO histo-blood group, factor VIII and von Willebrand factor. Transfus Med., 11, 343–51, 2001.

[23] Uemura,S.; Ishigami, K. I. and Soeda, T.; "Thin-cap fibroatheroma and microchannel findings in optical coherence tomography correlate with subsequent progression of coronary atheromatous plaques"; European Heart J., 33(1), 78–85, 2012.

[24] Sujirachato, K.; Worasuwannarak, W.; Srisont, S.; Udnoon, J. and Peonim, V.; "ABO Blood Group and Coronary Atherosclerosis in Thais at Ramathibodi Hospital", Siriraj Med J.; 67(2), 53-9, 2015.