Section 3
Cardiology

IRSTI 76.29.30: https://doi.org/10.26577/IAM.2021.v2.i1.010

Abdul Samad Ahmadi[1*] Kyat Abzaliyev[2]

[1]Balkh University, Balkh, Afghanistan,
[2]Al-Farabi Kazakh National University, Almaty, Kazakhstan
*e-mail: abdulsamadahmadi1015@gmail.com

THE RELATIONSHIP BETWEEN ABO BLOOD GROUP AND ATRIAL FIBRILLATION

Atrial fibrillation is the most common type of cardiac arrhythmia associated with substantial mortality and morbidity, largely due to thromboembolism, particularly stroke. AF shares strong association with cardiovascular diseases like hypertension, ischemic heart disease, congestive heart failure, valvular heart disease. Although almost all risks of AF have been overlooked but correlation between ABO blood group and AF in general has not been investigated. Hence, we decided to study and identify the link between ABO blood group and AF.

To fully assess effects of ABO blood group on AF and investigate the interaction between blood groups and sex on the prevalence of atrial fibrillation.

This is a retrospective descriptive cross-sectional study. The data originates from database of "Scientific Research Institute of Cardiology and Internal Diseases" Almaty city, Kazakhstan during 2019. AF was confirmed using an electrocardiograph. IBM SPSS version 22 was used to conduct the statistical analyses.

There were 475 patients with atrial fibrillation included in this study. A total of 279 patients (58.7%) were male, and 196 patients (41.3%) were female. The distribution of ABO blood group in the patients was as follows: 165 patients had blood group A (34.7%), 112 patients had blood group B (23.6%), 52 patients had blood group AB (10.9%) and 146 patients had blood group O (30.7%). After comparison of O blood group with non O blood groups there was no significant difference in number of O and A blood groups (P = 0.282), but other non O blood groups had significant differences in number [B (P = 0.035), AB (P = 0,000)].

Our results establish that non-O blood groups act as an independent risk factor for AF compared with individuals having O type blood.

Key words: Atrial fibrillation, ABO blood group, comorbidities.

Introduction

The most common form of cardiac arrhythmia is atrial fibrillation (AF) [1]. Patients are at raised risk for death, heart failure, hospitalization, and thromboembolic occurrences [2–4]. In the United States, it affects between 2.7 and 6.1 million people [5]. AF is highly age-related and affecting 4% of people over the age of 60 and 8% over the age of 80. Approximately 25% of people over the age of 40 will experience AF at some point in their lives [6]. In addition to age, there are many types of cardiac and medical conditions that are also closely linked to AF such as: hypertension, coronary artery disease, heart failure, obesity, valvular heart disease, diabetes mellitus, thyrotoxicosis, and sleep apnea syndrome [7]. Therefore, AF has a strong association with cardiovascular diseases.

The ability of human ABO blood type to influence von Willebrand factor (VWF) and factor VIII (FVIII) plasma levels has been shown to be a risk factor for cardiovascular disorders [8,9]. Blood group O can protect against non-valvular atrial fibrillation related to peripheral cardioembolic complications, which could be due to lower circulating of the von Willebrand factor levels [10]. Beyond immunity, the ABO blood groups are involved in physiological and pathological processes [11]. Nonetheless, no

previous correlation between ABO blood group and cardiac arrhythmias has been identified or published in the literature. Except one article to figure out the possible link between ABO blood group and isolated AF [12].

To fully evaluate ABO blood group and other possible risk factors for AF and types of AF, we conducted a cross-sectional study and included hypertension, CHF, IHD, diabetes mellitus (DM) and history of CVA in the comorbidities. We also investigated the interaction between ABO blood group and sex on the prevalence of AF. Based on a study in 2014 which included 369 healthy Kazakh donors, blood group O is the most common blood group, followed by A, B, and AB [13].

Justification of the choice of articles and goals and objectives

Aim

To assess the link between ABO blood group and atrial fibrillation

Materials and Methods

This was a year-long retrospective descriptive cross-sectional study. A consecutive nonrandom sampling technique was used to pool all patients with AF who admitted in «Scientific Research Institute of Cardiology and Internal Diseases» Almaty city, Kazakhstan. A total of 475 patients (279 males and 196 females) were selected.

Median age of patients was 65 years and IQR between 58-70. All were diagnosed with AF by the cardiologist, and AF was confirmed using an electrocardiogram (ECG). Patients were given a comprehensive physical examination with a detailed clinical historycollection. IBM SPSS version 22 was used to conductthe statistical analyses. Normality of variables was tested by Kolmogorov-Smirnov test. Abnormally- distributed data is presented as median (interquartile range), and analyzed using Mann–Whitney U test. Dichotomous variables were analyzed with Pearson'schi-squared test, and expressed as percentages. Multivariate logistic regression analysis was performed using a forced entry method of base-line clinical characteristics to examine the associations ofthe non-O and O blood groups with risks AF, as wellas to examine those of any type of the ABO blood group. The P-value cutoff point of 0.05 was used toassess the degree of significance.

Results and Discussion

As shown in Table 1, there were 475 patients with atrial fibrillation included in this study. A total of 279 patients (58.7%) were male, and 196 patients (41.3%) were female. The distribution of ABO blood group in the patients was as follows: 165 patients had blood group A (34.7%), 112 patients had blood group B (23.6%), 52 patients had blood group AB (10.9%) and 146 patients had blood group O (30.7%) (Figure 1).

Table 1 – General characteristics of study population (n=475)

variables	All cases	%	ABO blood groups								Test of differences	
		A		B		AB		O				
		N	%	N	%	N	%	N	%	X2	P-Value	
Sex												
male	279	58.7%	88	53.3%	71	63.4%	30	57.7%	90	61.6%	3.522	0.318
female	196	41.3%	77	46.7%	41	36.6%	22	42.3%	56	38.4%		
Age median (IQR) years	65 (58 - 70)		65 (59 - 70)		66 (59 - 70)		68 (59 - 73)		64 (57 - 70)		0.000	
Age group												

<39		12	2.5%	5	3.0%	2	1.8%	0	0.0%	5	3.4%	10.797	.546
40-49		33	6.9%	12	7.3%	7	6.3%	5	9.6%	9	6.2%		
50-59		83	17.5%	25	15.2%	20	17.9%	9	17.3%	29	19.9%		
60-69		212	44.6%	78	47.3%	54	48.2%	16	30.8%	64	43.8%		
>=70		135	28.4%	45	27.3%	29	25.9%	22	42.3%	39	26.7%		
Rh_Factor													
Negative		43	9.1%	21	12.7%	7	6.3%	3	5.8%	12	8.2%	4.579	0.205
Positive		432	90.9%	144	87.3%	105	93.8%	49	94.2%	134	91.8%		
Comorbidities													
HTN	no	60	12.6%	19	11.5%	16	14.3%	6	11.5%	19	13.0%	0.540	0.910
	yes	415	87.4%	146	88.5%	96	85.7%	46	88.5%	127	87.0%		
CHF	no	204	42.9%	70	42.4%	48	42.9%	20	38.5%	66	45.2%	0.750	0.861
	yes	271	57.1%	95	57.6%	64	57.1%	32	61.5%	80	54.8%		
IHD	no	157	33.1%	56	33.9%	35	31.3%	14	26.9%	52	35.6%	1.540	0.673
	yes	318	66.9%	109	66.1%	77	68.8%	38	73.1%	94	64.4%		
DM2	no	363	76.4%	127	77.0%	83	74.1%	42	80.8%	111	76.0%	0.919	0.821
	yes	112	23.6%	38	23.0%	29	25.9%	10	19.2%	35	24.0%		
History of CVA	no	424	89.3%	148	89.7%	105	93.8%	46	88.5%	125	85.6%	4.446	0.217
	yes	51	10.7%	17	10.3%	7	6.3%	6	11.5%	21	14.4%		
Obesity	no	286	60.2%	96	58.2%	73	65.2%	31	59.6%	86	58.9%	1.549	0.671
	yes	189	39.8%	69	41.8%	39	34.8%	21	40.4%	60	41.1%		
TTx	no	469	98.7%	164	99.4%	110	98.2%	51	98.1%	144	98.6%	1.011	.799[a,b]
	yes	6	1.3%	1	.6%	2	1.8%	1	1.9%	2	1.4%		
RVHD	no	463	97.5%	160	97.0%	109	97.3%	51	98.1%	143	97.9%	0.389	.942[a]
	yes	12	2.5%	5	3.0%	3	2.7%	1	1.9%	3	2.1%		
Smoking	no	421	88.6%	143	86.7%	98	87.5%	44	84.6%	136	93.2%	4.566	0.206
	yes	54	11.4%	22	13.3%	14	12.5%	8	15.4%	10	6.8%		
Types of AF													
paroxysmal		179	37.7%	71	43.0%	50	44.6%	16	30.8%	42	28.8%	15.735	.073
persistent		118	24.8%	31	18.8%	24	21.4%	14	26.9%	49	33.6%		
long standing persistent		76	16.0%	27	16.4%	17	15.2%	11	21.2%	21	14.4%		
permanent		102	21.5%	36	21.8%	21	18.8%	11	21.2%	34	23.3%		
Total		475	100.0%	165	34.7%	112	23.6%	52	10.9%	146	30.7		

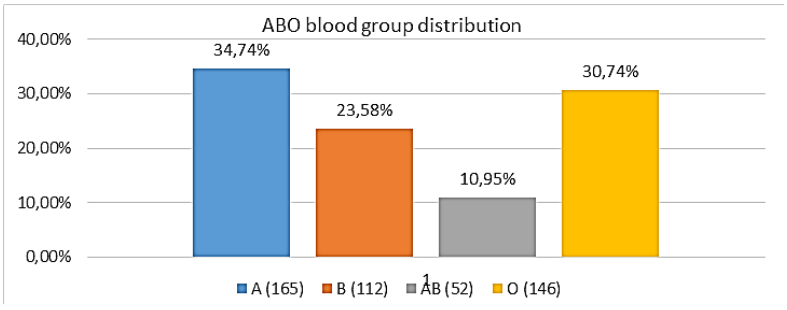

Figure 1– Distribution of ABO blood group in patients with atrial fibrillation

After comparison of O blood group with non-O blood groups there was no significant difference in number of O and A blood groups (P = 0.282), but other non-O blood groups had significant differences in number [B (P = 0.035), AB (P = 0,000)] (Table 2).

Table 2 – Comparison of O and non-O blood groups (n=475)

Comparison of O and non-O blood group				Test of difference		
Blood groups		Number	%	P -Value		
A		165	34.7%	0.282		
B		112	23.6%	0.35		
AB		52	10.9%	0,000		
O		146	30.7%			
Total		475	100.0%			
Estimation of blood groups						
Blood groups		B	Std. Error	Wald	DF	Sig.
A	Intercept	.122	.114	1.159	1	.282
B	Intercept	-.265	.126	4.454	1	.035
AB	Intercept	-1.032	.161	40.865	1	.000
a. The reference category is: O.						

Types of atrial fibrillation distributed as follows: 179 patients had paroxysmal AF (37.7%), 118 patients had persistent AF (24.8%), 102 patients had permanent AF (21.5%) and 76 patients had long standing persistent AF (16.0%) Figure 2. Differences in sex, age groups, Rh factor, comorbidities such as hypertension, congestive heart failure, ischemic heart diseases, diabetes mellitus, history of CVA, obesity, thyrotoxicosis, rheumatic heart disease and smoking between patients with different ABO blood groups were not significant. The most common associated comorbidities for atrial fibrillation were hypertension 415 (87.4%), IHD 318 (66.9%) and CHF 271 (57.1%), DM 112 (23.6%) and a history of CVA 51 (10.7). Paroxysmal atrial fibrillation was the most common type of AF which accounted in 179 (37.7%) patients.

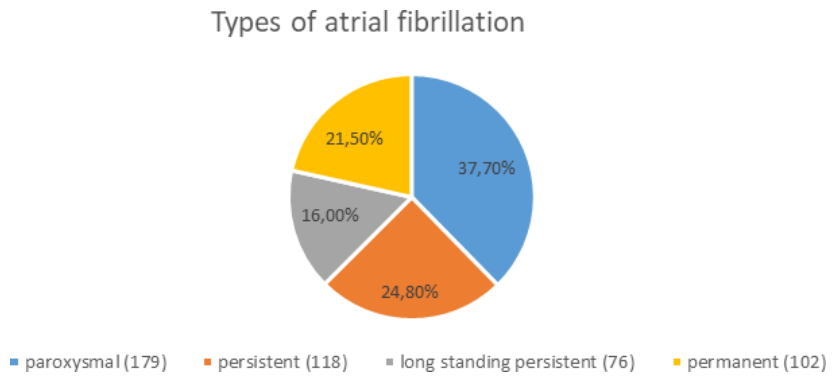

Figure 2 – The distribution of types of atrial fibrillation

In this cross-sectional study, we foundthat patients with non-O blood groups were at significantly increased risk for atrial fibrillation over that in patients with blood group O. However, the risk has not been statistically estimated although roughly suggested from the results. The relationship between non-O blood groups and risk of myocardial infarction and venous thromboembolism reported by many studies [14]. The blood group O is the most common type in Kazakhstan [13] genotyping employs a different strategy and is aimed directly at genes that determine the surface proteins. ABO blood group genotyping by real-time PCR has several crucial advantages over other PCR-based techniques, such as high rapidity and reliability of analysis. The purpose of this study was to examine nucleotide substitutions differences by blood types using a PCR-based method on Kazakh blood donors. Methods. The study was approved by the Ethics Committee of the National Center for Biotechnology. Venous blood samples from 369 healthy Kazakh blood donors, whose blood types had been determined by serological methods, were collected after obtaining informed consent. The phenotypes of the samples included blood group A (n = 99, however, non-O blood groups (mostly A type) show strong association with atrial fibrillation according to the results of our study. Many studies demonstrated that the immune system (inflammatory process) plays an important role in the production of systolic and diastolic hypertension [15]. This is what raises the red flag when considering a possible connection and clarification between blood group and AF. Generally, patients with non-O blood groups have higher tendency to develop atrial fibrillation. There was no evidence between ABO blood group interaction and sex on the prevalence of atrial fibrillation. Paroxysmal atrial fibrillation was the most common types of AF which accounts 179 (37.7%).

Conclusion

Results from the study of relationship between ABO blood group and AF show that non-O blood groups, especially A group, have a significant correlation with the risk of developing AF when compared to people with O blood group. Differences in data by sex, age groups, Rh factor, concomitant diseases, such as arterial hypertension, congestive heart failure, coronary heart disease, diabetes mellitus, history of cardiovascular disease, obesity, thyrotoxicosis, rheumatic heart disease, and smoking among the patients with various ABO blood groups were not significant. The most frequent comorbidities of atrial fibrillation were arterial hypertension 415 (87.4%), IHD 318 (66.9%) and 271 CHF (57.1%), DM 112 (23.6%) and a history of CVA 51 (10.7%).

References

1. Ferrari R, Bertini M, Blomstrom-lundqvist C, Dobrev D, Kirchhof P, Pappone C, et al. An update on atrial fi brillation in 2014: From pathophysiology to treatment. Int J Cardiol [Internet]. 2016;203:22–9. Available from: http://dx.doi.org/10.1016/j.ijcard.2015.10.089

2. Benjamin EJ, Wolf PA, D'Agostino RB, Silbershatz H, Kannel WB, Levy D. Impact of atrial fibrillation on the risk of death: The Framingham Heart Study. Circulation. 1998;98(10):946–52.

3. Chugh SS, Blackshear JL, Shen WK, Hammill SC, Gersh BJ. Epidemiology and natural history of atrial fibrillation: Clinical implications. J Am Coll Cardiol. 2001;37(2):371–8.

4. Patel NJ, Deshmukh A, Pant S, Singh V, Patel N, Arora S, et al. Contemporary trends of hospitalization for atrial fibrillation in the united states, 2000 through 2010 implications for healthcare planning. Circulation. 2014;129(23):2371–9.

5. Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, et al. Executive summary: Heart disease and stroke statistics-2016 update: A Report from the American Heart Association. Circulation. 2016;133(4):447–54.

6. Lloyd-Jones DM, Wang TJ, Leip EP, Larson MG, Levy D, Vasan RS, et al. Lifetime risk for development of atrial fibrillation: The framingham heart study. Circulation. 2004;110(9):1042–6.

7. Goudis CA, Korantzopoulos P, Ntalas I V., Kallergis EM, Ketikoglou DG. Obesity and atrial fibrillation: A comprehensive review of the pathophysiological mechanisms and links. J Cardiol [Internet]. 2015;66(5):361–9. Available from: http://dx.doi.org/10.1016/j.jjcc.2015.04.002

8. Franchini M, Capra F, Targher G, Montagnana M, Lippi G. Relationship between ABO blood group and von Willebrand factor levels: From biology to clinical implications. Thromb J. 2007; 5: 1–5.

9. Franchini M, Favaloro EJ, Targher G, Lippi G. ABO blood group, hypercoagulability, and cardiovascular and cancer risk. Crit Rev Clin Lab Sci. 2012;49(4):137–49.

10. Blustin JM, Mcbane RD, Mazur M, Ammash N, Sochor O, Grill DE, et al. The Association Between Thromboembolic Complications and Blood Group in Patients With Atrial Fibrillation. Mayo Clin Proc [Internet]. 2015;90(2):216–23. Available from: http://dx.doi.org/10.1016/j.mayocp.2014.11.013

11. Fu Y, Li K, Yang X. ABO blood groups: A risk factor for left atrial and left atrial appendage thrombogenic milieu in patients with non-valvular atrial fibrillation. Thromb Res [Internet]. 2017;156:45–50. Available from: http://dx.doi.org/10.1016/j.thromres.2017.05.018

12. Hassan SA. Relationship between ABO Blood Groups and Lone Atrial Fibrillation in Iraqi Patients. Am J PharmTech Res. 2018;8(5):275–80.

13. Tarlykov P, Raiymbek D, Zholdybayeva E, Ramanculov E. ABO Blood Group Genotyping by Real-time PCR in Kazakh Population. Cent Asian J Glob Heal. 2014;3:3–4.

14. Nisha Afonso, Amit Dang VN, Kamat S, Padmanabh V Rataboli. ABO blood groups and myocardial infarction among Palestinians. Ann Card Anaesth. 2009;12(2):171–3.

15. Patel P, Dokainish H, Tsai P, Lakkis N. Update on the Association of Inflammation and Atrial Fibrillation. J Cardiovasc Electrophysiol. 2010;21: 1064–70.