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Original Article

ABO blood groups and rheumatic diseases

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Abstract

Objective: Various genetic and environmental risk factors have been shown to be associated with the incidence of rheumatic diseases. However, the pathogenesis of rheumatic diseases poorly understood. Several studies have shown associations of ABO blood groups with various diseases. Our study aimed to determine whether there is an association between the types of rheumatic diseases and ABO and Rh blood groups.

Material and Methods: The study included the patients, followed up at the Immunology-Rheumatology clinic between January 2016 and December 2016 for diagnosis of rheumatic disease, who had an ABO Rh blood data. Age, gender, type of rheumatic disease, ABO Rh blood groups were recorded.

Results: When 823 patients were assessed for blood types, 42.5% patients had A type, 33.2% had O type, 15.4% had B type, and 8.9% had AB type. There was significant difference in the distribution of blood types in rheumatic diseases. While SpA, vasculitis, UCTD, Behçet's and RA were more common in the patients with A blood type; FMF, SLE, SSc and SjS were more common in the patients with O blood type. In addition, the blood type where all the diseases are observed the least commonly was AB. There was significant difference in the distribution of Rh factor in rheumatic diseases. 92.2% patients were Rh positive and 7.8% patients were Rh negative.

Conclusion: In our study, we thought that the higher incidence of different rheumatic diseases in different blood types was associated with different genetic predisposition.

Keywords: ABO blood group, rheumatic diseases, rh factor

Introduction

Although various blood group systems have been described based on different blood group antigens, in clinical practice, the relevant blood group systems are ABO and Rhesus. The ABO blood group system consists of four basic groups, namely A, B, AB, and O, depending on the presence of the A and B antigens. These antigens are controlled by three allelic A, B, and O genes located on the long arm of chromosome 9 (1). The blood groups in the Rhesus system are classified as Rh- and Rh+, depending on the presence of the Rhesus D antigen located on the red blood cell surface. Rh antigens are coded by three pairs of allele genes on chromosome 1. The major antigen of this group is Rho(D) (2). Although the entire human population shares similar ABO and Rh blood groups, the frequency and distribution of the blood groups vary among nationalities and races (3). The distribution of ABO blood groups worldwide is O>A>B>AB, whereas it is A>O>B>AB and Rh+>Rh- in Turkey (4-10).

The association of ABO and Rh blood groups with various diseases, such as cancer, cardiovascular disorders, infections, and diabetes mellitus, has been demonstrated (11-14).

Our study aimed to determine whether there is an association between types of rheumatic diseases and the ABO and Rh blood groups.

Material and Methods

The study included patients followed up at the Immunology-Rheumatology clinic in Aydın (Turkey) between January 2016 and December 2016 because of the diagnosis of a rheumatic disease and with ABO and Rh blood group data. Patient files were examined; age, gender, types of rheumatic diseases, and ABO

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and Rh blood groups were recorded. For this retrospective study, approval was obtained from the Ethics Committee for Non-invasive Clinical Studies at the Adnan Menderes University School of Medicine (No: 2017/1061). As this study was retrospectively designed, there was no requirement of informed consent forms.

Statistical evaluation: The Statistical Package for Social Science (SPSS) 18.0 software (IBM Corp.; Armonk, NY, USA) was used for the statistical evaluation of data. Data are presented as mean±standard derivation and percentage. The chi-square test was used for investigating the correlation between the types of rheumatic diseases and blood groups. P-values of <0.05 were considered statistically significant.

Results

In the study, the mean age of the patients was 48.44±14.8 years; a total of 823 patients, including 581 (70.6%) female and 242 (29.4%) male patients, were examined. There were nine types of diseases, including spondyloarthropathy (SpA), vasculitis, undifferentiated connective tissue disease (UCTD), Behçet's diseases, familial Mediterranean fever (FMF), systemic lupus erythematosus (SLE), systemic sclerosis (SSc), Sjögren's syndrome (SjS), and rheumatoid arthritis (RA). In total, 350 (42.5%) patients had blood group A type, 273 (33.2%) had O type, 127 (15.4%) had B type, and 73 (8.9%) had AB type. There was significant difference in the distribution of blood types in rheumatic diseases. While SpA, vasculitis, UCTD, Behçet's disease, and RA were more common in the patients with the A blood type, FMF, SLE, SSc and SjS were more common in the patients with the O blood type. In addition, the blood type where all the diseases were observed the least commonly was AB blood type (Table 1).

There was significant difference in the distribution of Rh factor in rheumatic diseases. In total, 759 (92.2%) patients were Rh positive and 64 (7.8%) patients were Rh negative (Table 2).

In terms of the distribution by the ABO blood groups, the O blood type had SLE, SSc, and FMF at the highest rate; the A blood type had vasculitis, UCTD, RA, and SpA at the highest rate; the B blood type had Behçet's disease and

Table 1. Frequency of ABO blood groups in cases of rheumatic diseases

	n		O		A		B		AB		
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Significance
SpA	149	18.10	37	24.80	70	47.00	28	18.80	14	9.40	
Vasculitis	33	4.00	9	27.30	19	57.60	2	6.10	3	9.10	
UCTD	41	5.00	16	39.00	22	53.70	2	4.90	1	2.40	
Behçet's disease	36	4.40	10	27.80	12	33.30	9	25.00	5	13.90	$\chi2$=56.404
FMF	54	6.60	25	46.30	12	22.20	12	22.20	5	9.30	df=24
SLE	93	11.30	44	47.30	30	32.30	10	10.80	9	9.70	p=.000
SSc	49	6.00	23	46.90	14	28.60	8	16.30	4	8.20	
SjS	50	6.10	17	34.00	15	30.00	9	18.00	9	18.00	
RA	318	38.60	92	28.90	156	49.10	47	14.80	23	7.20	
Total	823	100	273	33.2	350	42.5	127	15.4	73	8.9	

SpA: spondyloarthropathy; UCTD: undifferentiated connective tissue disease; FMF: Familial Mediterranean fever; SLE: Systemic lupus erythematosus; SSc: systemic sclerosis; SjS: Sjögren's syndrome; RA: rheumatoid arthritis

Table 2. Frequency of Rh factor in cases of rheumatic diseases

	Rh-		Rh+		Total		Significance	
	Number	Percent	Number	Percent	Number	Percent	$\chi2$	p
SpA	11	7.40	138	92.60	149	100		
Vasculitis	1	3.00	32	97.00	33	100		
UCTD	2	4.90	39	95.10	41	100		
Behçet's disease	4	11.10	32	88.90	36	100		
FMF	4	7.40	50	92.60	54	100		
SLE	4	4.30	89	95.70	93	100	47.38	.000
SSc	6	12.20	43	87.80	49	100		
SjS	3	6.00	47	94.00	50	100		
RA	29	9.10	289	90.90	318	100		
Total	64	7.80	759	92.20	823	100		

Rh: rhesus; SpA: spondyloarthropathy; UCTD: undifferentiated connective tissue disease; FMF: Familial Mediterranean fever; SLE: systemic lupus erythematosus; SSc: systemic sclerosis; SjS: Sjögren's syndrome; RA: rheumatoid arthritis

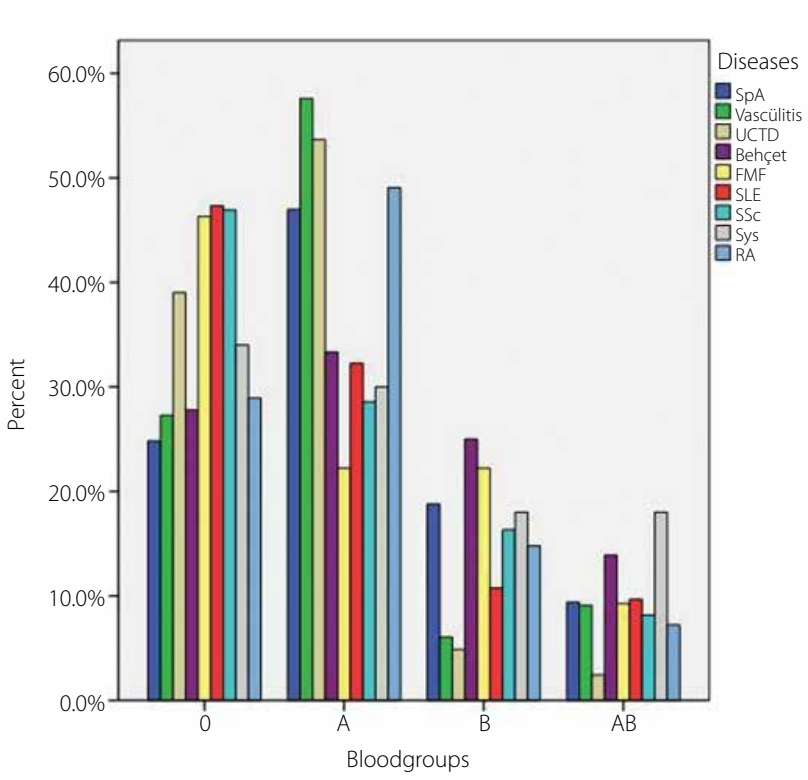

Figure 1. Segregation of diseases according to ABO blood groups

FMF at the highest rate; and the AB blood type had SjS at the highest rate (Figure 1).

Discussion

In our study, the most common blood type in all the rheumatic diseases was A, followed by O, B, and AB. Our study does not have data for the normal population, and the distribution of blood types for the normal population in other studies conducted in Turkey is A>O>B>AB and Rh+>Rh- (5-10). Generally, the blood type distribution in rheumatic diseases appears to be the same as the normal population. Considering the type of rheumatic disease, the distribution of blood groups for RA, SpA, vasculitis, UCTD, and Behçet's disease is A>O>B>AB, which appears to be the same as that in the normal population. The most common blood type for FMF, SLE, SSc, and SjS is type O, followed by A, B, and AB. Also, in our study, the rate of Rh factor positivity is higher in all the diseases groups.

In the literature, studies investigating the association of RA and ankylosing spondylitis (AS) with blood types are available, and similar to our study, the most common blood type in both diseases has shown to be A and the least common blood type has been shown to be AB (15, 16). In the literature, we found a study investigating the relationship between Behçet's disease and blood types, wherein no significant difference with the control group was detected, and blood types O and A were found to be more common at similar rates (10). In a study of discoid lupus, blood type A was found to be at a higher rate, which was followed by blood types O, B Please use consistent font formats for column headings in Tables 1 and 2. Similarly, use uniform alignment for row headings for the tables, and AB (17). In our study, all patients were followed up because of the diagnosis of SLE. In these patients, blood type O was positive at a higher rate, which was followed by blood types A, B, and AB.

In the literature, there were no studies investigating the association between SSc, SjS, and SLE and blood types. In our study, we found that the blood type O was the most common in all three groups of connective tissue disorders, followed by blood types A, B, and AB. Further, we did not find a study of FMF, an autoinflammatory disease, in the literature, and in our study, blood type A was found to be the most common in FMF patients.

In our study, an interesting finding was that blood type A was found to be at the highest rate in patients with RA and AS with erosive arthritis, which are the most common rheumatic diseases, and blood type O was found to be at the highest rate in patients with SLE, SSc, and SjS, which are among the connective tissue disorders frequently observed with antinuclear antibodies. The reason for this could be the difference in the genetic characteristics of the diseases.

Various genetic and environmental risk factors have been shown to be associated with the incidence of rheumatic diseases (18, 19). Studies on genetic and environmental risk factors in rheumatic diseases have been conducted in patients with RA owing to its partially homogeneous disease phenotype and high prevalence (20). In major histocompatibility complex, the polymorphism of the three human leukocyte antigen (HLA) genes (HLA-DRB1, HLA-DP1, and HLA-B) is highly related to RA (21). As in RA and other autoimmune diseases, HLA genes are thought to have a central role in the predisposition to SLE. HLA-DRB1*03:01 and *15:01 haplotypes have been described as strong genetic risk factors for SLE in the European population (18). Different from other rheumatic diseases, the genetic relationship has been largely described in AS patients, and the rate of HLA-B27 positivity is known to be approximately 90% in these patients (22, 23). Although the genetic mechanism cannot be thoroughly explained in all patients, there is a strong relationship between Behçet's disease and HLA-B51 (24).

It has been demonstrated that the genetic markers of autosomal recessive FMF are associated with HLA-DR4 alleles and that HLA-DR levels increase during attacks compared to those in controls; studies have described the association between FMF and HLA-DR (25, 26).

In SSc, some alleles on HLA-DRB1, DQB1, DPB1, and DPB2 have been shown to be risk factors for the disease (27-30). The association between HLA DR-2 and DR-3 has been described, and in subsequent studies of SjS, the haplotypes DRB1* 0301 (HLA DR-3), DQB1 *0201, and DRB1*1501(DR-2) have been shown to be associated with the disease (31).

The strongest HLA association with antineutrophil cytoplasmic autoantibody-associated vasculitis has been shown to be with HLA DPB1 (32).

The ABO blood groups are clinically practicable parameters for performing genetic assessments. In our study, we believe that the higher incidence of different rheumatic diseases in different blood types is associated with different genetic predispositions.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Adnan Menderes University School of Medicine (No: 2017/1061).

Informed Consent: As this study was retrospectively designed, there was no requirement of informed consent forms.

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