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Original Article **Open Access**

The association of main blood groups and development of Systemic Lupus Erythematosus and its organ involvements

Shirin Assar[1]*, Dena Mohamadzadeh[1], Sima Golmohammadi[1], Zhovan Fatahi[1]

[1] *Clinical Research Development Center, Imam Reza Hospital, Kermanshah University of Medical Sciences, Kermanshah, Iran.*

Systemic lupus erythematosus (SLE) is one of the most common systemic inflammatory diseases and can damage various organs. This study aimed to compare the frequency of major blood groups and their relationships with SLE organ involvement in lupus patients and a control group. In this case-control study, 326 patients with SLE who attended rheumatology clinics of Kermanshah and 335 healthy individuals were included (age: cases = 36.77±11.43, controls = 36.2±12.72, *p value* = 0.053; female sex: cases=332 (98.8%), controls = 335 (100%), *p value* = 0.059). Blood groups (BGs) of the patients and the controls were provided. Organ involvement was assessed using patients' records, periodic follow-up tests, and clinical examinations.

In general, without considering RH, there was no significant difference in the distribution of O, A, B, and AB blood groups between the SLE patients and the controls. There was no relation among different organ involvements in SLE patients and BGs except for mucosal skin lesions which were significantly higher in the AB blood group (*p value* < 0.05). In RH positive individuals, there was a significant difference in the frequency of the AB blood group between SLE patients and the controls (23 (7.4%) vs. 36 (11.7%), *p value* = 0.034). In RH negative individuals, there was a significant difference in the frequency of the A blood group between SLE patients and the controls (2 (13.3%) vs. 10 (37%), *p value* = 0.037).

There is no difference in the frequency of different BGs between SLE patients and healthy people. Moreover, no significant relation between different organ involvement in Lupus patients and BG was found, except for mucosal ulcers. Therefore, 'blood group cannot be used as a predictor of disease status.

Keywords: Blood groups, Systemic lupus erythematosus

Introduction

Systemic Lupus Erythematosus (SLE) is an autoimmune disease with autoantibody and immune complex development. In a large percentage of patients with SLE, auto-antibodies are detectable before the onset of clinical symptoms. These patients are confronted with systemic symptoms such as fatigue, muscle and joint pain [1]. The status of organ involvement is crucial in determining lupus treatment strategy. Many factors and genes are involved in the pathogenesis of SLE, one possible one being blood group (BG). Research has indicated that blood group may be related to autoimmune disorders, especially SLE disease [2]. In a previous study, the relation between H-blood group and adhesion molecules in rheumatoid arthritis (RA) patients was investigated, and the results showed that the H antigen plays a role in inflammatory cell migration; thus, this antigen potentially has a role in inflammatory conditions [2]. One of the prominent symptoms of SLE is peripheral vascular manifestation. Research on the ABO blood group and risk of vascular disease has indicated that peripheral vascular diseases are more common in people with blood types other than O. Therefore, it seems that the ABO type is likely to influence the severity of vascular complications in SLE [3]. Evidence also points to the association between anti-phospholipid syndrome and lupus disease, and there is a study that has indicated the role of the ABO blood system in anti-phospholipid syndrome [4, 5]. The evaluation of immune responses to A and B antigens in SLE patients indicated that patients with SLE showed enhanced responses to blood group antigens with high titer of iso-hemagglutinin in comparison to the control group [6]. Based on this study, SLE may be more severe in patients with this type of blood antigen.

In the current study, the frequency of the main blood group in SLE patients and the control group were

*Corresponding Author: Shirin Assar., Clinical Research Development Center, Imam Reza Hospital, Kermanshah University of Medical Sciences, Kermanshah, Iran, E-mail: sh758us@yahoo.com, Telefax: +98-833-427-4623.

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compared. The relation between BG type and organ complication has also been evaluated in SLE patients.

Materials and Methods

The current case-control study was performed in accordance with the Declaration of Helsinki and approved by the Ethical Committee of Kermanshah University of Medical Sciences (KUMS) (Number: 96292). All participants voluntarily signed informed consent forms, and the purpose and processes of this research were explained to them. Patients were selected through convenience sampling from rheumatology clinics of KUMS. All patients were diagnosed according to the 2012 SLICC SLE criteria by an expert rheumatologist. A total of 335 SLE patients were enrolled in this study. Inclusion criteria comprised meeting the 2012 SLICC SLE criteria. Patients with a history of other rheumatic and autoimmune diseases, severe infection, cancer, and pregnant women were excluded from the study. A total of 336 age- and sex-matched healthy subjects were included as normal controls. The age, sex, and race of each participant was recorded and compared between SLE patients and the control group. Five milliliters of peripheral blood were collected from each participant (patient and control) for blood group (BG) determination. Organ involvement was assessed using patients' records, periodic follow-up tests, and clinical examinations in lupus patients. The frequency of different BGs in SLE patients and the control group was compared, and different organ involvements in SLE patients in association with BG type were evaluated.

Statistical Analysis

Data was analyzed using SPSS software version 25 (SPSS, Chicago, IL, USA), GraphPad Prism version 6 (GraphPad Software, La Jolla, California, USA), and Microsoft Excel 2010. The number and percentage for all categorical variables and mean (SD) for continuous variables are reported. The chi square test was used to compare gender and race, and the nonparametric T test was used to compare age between the groups. The chi square and Fisher exact tests were employed to assess the ABO type comparison between two groups. In all statistical analyses, p *value* < 0.05 was considered statistically significant, and the results were expressed as mean ± SEM.

Results

Demographic and clinical characteristics

In total, 335 SLE patients and 336 age- and sex-matched healthy subjects were included in this study. The demographic and clinical variables of all participants are shown in Table 1. No significant difference between the two groups were observed in age, sex, or race (p *value* > 0.05).

Table 1. The demographic and clinical variables of SLE patients and control group

	Groups		*P value*
	SLE patients	**control**	
Age (year) Mean±SD	36.77±11.43	36.2±12.72	0.053
Sex			
Female	332(98.8%)	335(100%)	0.059
Male	4(1.2%)	0(0%)	
Race			
Kurd	317(97.2%)	334(99.7)	
Turk	1(0.3%)	0(0%)	
Fars	6 (1.8%)	1(0.3)	0.075
Lurs	2(0.6%)	0(0%)	

Frequency of ABO and RH blood groups in SLE patients and healthy control

The frequency rates of BGs in lupus patients and healthy controls are compared in Table 2. The most common BG was O (39.3%) in SLE patients and A (35.5%) in the control group. Considering RH, the most frequently detected BG in SLE patients was O+ followed by A+. Inversely, the most frequently detected BG in controls was A+ followed by O+. AB- was the least frequently reported BG in both patients and controls. In RH+ individuals, there was a significant difference between patients with lupus and healthy subjects in terms of the AB blood group (23 (7.4%) vs. 36 (11.7%), p *value* = 0.034). In RH- individuals, there was a significant difference between patients with lupus and healthy subjects in terms of the A blood group (2 (13.3%) vs. 10 (37%), p *value* = 0.037). In general, without considering RH, there was no significant difference in ABO blood group between patients with lupus and healthy individuals (p *value* > 0.05).

Table 2. The frequency of blood groups in lupus patients and healthy controls

RH	ABO	Groups		*P Value*
		SLE patients Frequency (%)	**Control group** Frequency (%)	
+	**O**	119(38.3%)	103 (33.4%)	0.102
	A	103 (33.1%)	109 (35.4%)	0.274
	B	66 (21.2%)	60 (19.5%)	0.3
	AB	23 (7.4%)	36 (11.7%)	0.034
-	**O**	9 (60%)	10 (37%)	0.11
	A	2 (13.3%)	10 (37%)	0.037
	B	3 (20%)	6 (22.2%)	0.505
	AB	1 (6.7%)	1 (3.7%)	>0.99
all	**O**	128 (39.3%)	113 (33.7%)	0.068
	A	105 (32.2%)	119 (35.5%)	0.1
	B	69 (21.2%)	66 (19.7)	0.31
	AB	24 (7.4%)	37 (11)	0.054

Frequency of organ involvement in patients with lupus and healthy individuals

The frequency rates of different organ involvements in patients with lupus and healthy individuals are summarized in Table 3. According to the results shown in Table 3, the most common organs involved in lupus patients were skin involvement, photosensitivity, and systemic symptoms such as fatigue, respectively. As the control group was selected from healthy and non-rheumatologic patients, there was no organ involvement in the healthy subjects.

Determination of the correlation between ABO blood groups and involved organs in SLE patients

The correlation between ABO blood group and involved organs in SLE patients is summarized in Table 4. Based on the data, skin involvement including mucosal ulcers had a significant correlation with ABO blood group; mucosal lesions were more common in the AB blood type compared with other blood groups (*p value* = 0.044). There was no significant relation between the ABO groups and the involvement of other organs (*p value* > 0.05)

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Table 3. The frequency of involved organs and the presence of auto-antibodies in patients with SLE and healthy individuals.

	Characteristic	groups	
		SLE patients Frequency (%)	**Control group** Frequency (%)
involved organs	Malar Rash	123 (37.7%)	0(0%)
	Light sensitivity	243 (74.5%)	0(0%)
	Alopecia	28 (8.6%)	0(0%)
	Discoid-Lupus Erythematosus (DLE)	5 (1.5%)	0(0%)
	SCLE	4 (1.2%)	0(0%)
Skin involvement	Mucosal ulcer	33 (10.1%)	0(0%)
	Hives	9 (2.8%)	0(0%)
	Sicca	4 (1.2%)	0(0%)
	Raynaud	22 (6.7%)	0(0%)
	Others	3 (0.9%)	0(0%)
Systemic Symptoms	Fever	8 (2.5%)	0(0%)
	Weight Loss	18 (5.5%)	0(0%)
	Fatigue	215 (66%)	2(0.6%)
Renal involvement	Presence of renal involvement	71 (21.8%)	0(0%)
Pulmonary involvement	Pleural effusion	13 (4%)	0(0%)

	Characteristic	groups	
		SLE patients	Control group
		Frequency (%)	Frequency (%)
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Skin involvement	Mucosal ulcer	33 (10.1%)	0(0%)
	Hives	9 (2.8%)	0(0%)
	Sicca	4 (1.2%)	0(0%)
	Raynaud	22 (6.7%)	0(0%)
	Others	3 (0.9%)	0(0%)
CNS involvement	Alveolar Hemorrhage	0 (0%)	0(0%)
	Lupus pneumonitis	4 (1.2%)	0(0%)
	Seizure	7 (2.1%)	0(0%)
	Psychosis	5 (1.5%)	0(0%)
	Lupoid sclerosis	1 (0.3%)	0(0%)
	Others	17 (5.2%)	0(0%)
Hematological involvement	Thrombocytopenia	69 (21.2%)	0(0%)
	Hemolytic Anemia	18 (5.5%)	0(0%)
	Leukopenia	28 (8.6%)	0(0%)
Articular involvement	Arthralgia	207(63.5%)	1(0.3%)
	Arthritis	110 (33.7%)	0(0%)
	Vascular necrosis	5 (1.5%)	0(0%)
Vascular involvement	Vasculitis	30 (9.2%)	0(0%)
	Deep vein thrombosis	12 (3.7%)	0(0%)
	Embolism	4 (1.2%)	0(0%)
Muscular involvement	Cyanosis	3 (0.9%)	0(0%)
		1 (0.3%)	0(0%)
Heart involvement	Pericardial effusion	8 (2.5%)	0(0%)
	Cardiomyopathy	1 (0.3%)	0(0%)
	Heart-valve involvement	0(0%)	0(0%)
Eye involvement		0(0%)	0(0%)
Gastrointestinal involvement	Autoimmune Hepatitis	2 (0.6%)	0(0%)
	Autoimmune Pancreatitis	0 (0%)	0(0%)
	Ascites	2 (0.6%)	0(0%)
	ANA	311 (95.4%)	7(2.09%)
	Anti-ds DNA	234 (71.8%)	0(0%)
	Complement decline	62 (19%)	0(0%)

	Characteristic	groups	
		SLE patients	**Control group**
		Frequency (%)	Frequency (%)
involved organs	Malar Rash	123 (37.7%)	0(0%)
	Light sensitivity	243 (74.5%)	0(0%)
	Alopecia	28 (8.6%)	0(0%)
	Discoid-Lupus Erythematosus (DLE)	5 (1.5%)	0(0%)
	SCLE	4 (1.2%)	0(0%)
Skin involvement	Mucosal ulcer	33 (10.1%)	0(0%)
	Hives	9 (2.8%)	0(0%)
	Sicca	4 (1.2%)	0(0%)
	Raynaud	22 (6.7%)	0(0%)
	Others	3 (0.9%)	0(0%)
Auto-antibodies existence	Anticardiolipin	36 (11%)	0(0%)
	β-2glycoprotein	14 (4.3%)	0(0%)
	Coombs	2 (0.6%)	0(0%)
	Anti-Ro	49 (15%)	0(0%)
	Anti-LA	22 (6.7%)	0(0%)
	Increased ESR	12 (3.7%)	0(0%)
	LA	9 (2.8%)	0(0%)
Antiphospholipid syndrome		1 (0.3%)	0(0%)
Abortion history		4 (1.2%)	0(0%)

Table 4. The correlation between ABO blood group and involved organs in SLE patients.

	Characteristic	ABO Blood groups				*P value*
		AB	B	A	O	
		Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	
involved organs	Malar Rash	20 (83.3%)	41 (59.4%)	59 (56.2%)	45 (35.2%)	0.079
	light sensitivity	17 (70.8%)	49 (71%)	78 (74.3%)	99 (77.3%)	0.763
	alopecia	3 (12.5%)	5 (7.2%)	9 (8.6%)	11 (8.6%)	0.89
	Discoid-Lupus Erythematosus (DLE)	0 (0%)	0 (0%)	3 (2.9%)	2 (1.6%)	0.446
	SCLE	0 (0%)	1 (1.4%)	2 (1.9%)	1 (0.8%)	0.817
Skin involvement	Mucosal ulcer	6 (25%)	9 (13%)	9 (8.6%)	9 (7%)	0.044
	Hives	0 (0%)	2 (2.9%)	5 (4.8%)	2 (1.6%)	0.401
	Sicca	0 (0%)	1 (1.4%)	1 (1%)	2 (1.6%)	0.917
	Raynaud	3 (12.5%)	5 (7.2%)	7 (6.7%)	7 (5.5%)	0.654
	others	0 (0%)	0 (0%)	0 (0%)	3 (2.3%)	0.196
	Fever	1(4.2%)	0	1 (1%)	6 (4.7%)	0.128
	Weight Loss	2 (8.3%)	1 (1.4%)	9 (8.6%)	6 (4.7%)	0.204

	Characteristic	ABO Blood groups				*P value*
		AB Frequency (%)	B Frequency (%)	A Frequency (%)	O Frequency (%)	
involved organs	Malar Rash	20 (83.3%)	41 (59.4%)	59 (56.2%)	45 (35.2%)	0.079
	light sensitivity	17 (70.8%)	49 (71%)	78 (74.3%)	99 (77.3%)	0.763
	alopecia	3 (12.5%)	5 (7.2%)	9 (8.6%)	11 (8.6%)	0.89
	Discoid-Lupus Erythematosus (DLE)	0 (0%)	0 (0%)	3 (2.9%)	2 (1.6%)	0.446
	SCLE	0 (0%)	1 (1.4%)	2 (1.9%)	1 (0.8%)	0.817
Skin involvement	Mucosal ulcer	6 (25%)	9 (13%)	9 (8.6%)	9 (7%)	0.044
	Hives	0 (0%)	2 (2.9%)	5 (4.8%)	2 (1.6%)	0.401
	Sicca	0 (0%)	1 (1.4%)	1 (1%)	2 (1.6%)	0.917
	Raynaud	3 (12.5%)	5 (7.2%)	7 (6.7%)	7 (5.5%)	0.654
	others	0 (0%)	0 (0%)	0 (0%)	3 (2.3%)	0.196
Systemic Symptoms	Fatigue	17 (70.8%)	45 (65.2%)	66 (62.9%)	87(68%)	0.813
Renal involvement		6 (25%)	12 (17.4%)	26 (24.8%)	27 (21.1%)	0.68
Pulmonary involvement	Pleural effusion	1(4.2%)	3 (4.3%)	4 (3.8%)	5 (3.9%)	0.998
	Alveolar Hemorrhage	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1
	Lupus pneumonitis	1(4.2%)	0 (0%)	1 (1%)	2 (1.6%)	0.431
CNS involvement	Seizure	0 (0%)	1 (1.4%)	1 (1%)	5 (3.9%)	0.35
	Psychosis	0 (0%)	1 (1.4%)	1 (1%)	3 (2.3%)	0.761
	Lupoid sclerosis	0 (0%)	1(1.4%)	0 (0%)	0 (0%)	0.291
	others	1 (4.2%)	4 (5.8%)	7 (6.7%)	5 (3.9%)	0.803
Hematological involvement	Thrombocytopenia	1 (4.2%)	19 (27.5%)	23 (21.9%)	26 (20.3%)	0.115
	Hemolytic Anemia	0 (0%)	4 (5.8%)	8 (7.6%)	6 (4.7%)	0.481
	Leucopenia	1 (4.2%)	8 (11.6%)	11(10.5%)	8 (6.3%)	0.43
Articular involvement	Arthralgia	16 (66.7%)	42 (60.9%)	65 (61.9%)	84 (65.6%)	0.879
	Arthritis	6 (25%)	30 (43.5%)	30 (28.6%)	44 (34.4%)	0.17
	Vascular necrosis	0 (0%)	3 (4.3%)	2 (1.9%)	0 (0%)	0.108
Vascular involvement	Vasculitis	2 (8.3%)	10 (14.5%)	8 (7.6%)	10 (7.8%)	0.4
	Deep vein thrombosis	2 (8.3%)	1 (1.4%)	6 (5.7%)	3 (2.3%)	0.23
	embolism	1 (4.2%)	0 (0%)	1 (1%)	2 (1.6%)	0.431
Muscular involvement	Cyanosis	0 (0%)	2 (2.9%)	1 (1%)	0 (0%)	0.224
		0 (0%)	1 (1%)	1 (1%)	0 (0%)	0.55
Heart involvement	Pericardial effusion	0 (0%)	2 (2.9%)	5 (4.8%)	1 (0.8%)	0.213
	Cardiomyopathy	0 (0%)	0 (0%)	0 (0%)	1 (0.8%)	0.67
	Heart-valve involvement	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1

	Characteristic	ABO Blood groups				*P value*
		AB Frequency (%)	B Frequency (%)	A Frequency (%)	O Frequency (%)	
involved organs	Malar Rash	20 (83.3%)	41 (59.4%)	59 (56.2%)	45 (35.2%)	0.079
	light sensitivity	17 (70.8%)	49 (71%)	78 (74.3%)	99 (77.3%)	0.763
	alopecia	3 (12.5%)	5 (7.2%)	9 (8.6%)	11 (8.6%)	0.89
	Discoid-Lupus Erythematosus (DLE)	0 (0%)	0 (0%)	3 (2.9%)	2 (1.6%)	0.446
	SCLE	0 (0%)	1 (1.4%)	2 (1.9%)	1 (0.8%)	0.817
Skin involvement	Mucosal ulcer	6 (25%)	9 (13%)	9 (8.6%)	9 (7%)	0.044
	Hives	0 (0%)	2 (2.9%)	5 (4.8%)	2 (1.6%)	0.401
	Sicca	0 (0%)	1 (1.4%)	1 (1%)	2 (1.6%)	0.917
	Raynaud	3 (12.5%)	5 (7.2%)	7 (6.7%)	7 (5.5%)	0.654
	others	0 (0%)	0 (0%)	0 (0%)	3 (2.3%)	0.196
Eye involvement		0 (0%)	0 (0%)	0 (0%)	0 (0%)	1
Gastrointestinal involvement	Autoimmune Hepatitis	0 (0%)	0 (0%)	1 (1%)	1 (0.8%)	0.842
	Autoimmune Pancrasis	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1
	Ascites	0 (0%)	1 (1.4%)	1 (1%)	0 (0%)	0.588
Auto-antibodies existence	ANA	22 (91.7%)	65 (94.2%)	102 (97.1%)	122 (95.3%)	0.633
	Anti-DNA	16 (66.7%)	47 (68.1%)	75 (71.4%)	96 (75%)	0.699
	Complement decline	4 (16.7%)	14 (20.3%)	19 (18.1%)	25 (19.5%)	0.971
	Anticardiolipin	2 (8.3%)	5 (7.2%)	15 (14.3%)	14 (10.9%)	0.509
	β-2glycoprotein	3 (12.5%)	3 (4.3%)	3 (2.9%)	5 (3.9%)	0.212
	Coombs	0 (0%)	0 (0%)	1 (1%)	1 (0.8%)	0.842
	Anti-Ro	5 (20.8%)	14 (20.3%)	17 (16.2%)	13 (10.2%)	0.202
	Anti-LA	2 (8.3%)	1 (1.4%)	10 (9.5%)	9 (7%)	0.214
	Increased ESR	1 (4.2%)	3 (4.3%)	2 (1.9%)	6 (4.7%)	0.705
	LA	0 (0%)	3 (4.3%)	4 (3.8%)	2 (1.6%)	0.486
Antiphospholipid syndrome		0 (0%)	0 (0%)	0 (0%)	1 (0.8%)	0.67
Abortion history		0 (0%)	1 (1.4%)	0 (0%)	3 (2.3%)	0.4

Discussion

According to the main results of this study, O and A were the most frequent blood groups in SLE patients compared to the other blood groups with frequency rates of 39.3% and 32.2%, respectively. The AB blood group was the least frequent BG in these patients (7.4%). The frequency of blood groups in healthy individuals was slightly similar to those with lupus. In general, the frequency of the ABO blood groups was not significantly different between patients with SLE and the healthy controls. Furthermore, the distribution of BG types in patients with SLE disease was similar to that of other people in Iran [7]. To date, no large-scale study has compared the frequency of major BGs between patients with lupus and healthy individuals and their association with organ involvement. This limits the possibility of comparison. Moreover, only a few studies have examined the frequency of BGs in people with SLE [8-12]. In a study by Tamega et al., the results were in line with those of the present study. They studied 69 discoid lupus erythematosus (DLE) patients and found that there was no significant

difference in the frequency of BGs between people with DLE and healthy subjects. The most common BGs in DLE patients were A (52%) and O (37%) types, and the AB group had the least frequency. They also reported an association between blood group A and having disseminate forms of the disease [8]. Another study that was conducted in Turkey in 2016 obtained similar results. They enrolled 823 patients with different types of rheumatic diseases including 93 SLE patients. They found that O (47.30%) and A (32.30%) had the highest frequency rates, and the AB (9.70%) group had the least frequency in SLE patients. These results were consistent with the distribution of BG worldwide, but contrary to the distribution in the general population of Turkey in which A type is higher than type O [9]. A previous study which included 1802 SLE patients from 100 countries all over the world, including 773 patients from the USA, revealed that susceptibility to the development of SLE is not influenced by BG typing. Similar to other studies, O (46,2%) and A (33.6%) were the most frequently reported BG types, this result was consistent with the blood group distribution in the USA general population. These two blood groups were also the most frequently reported ones in other autoimmune diseases (rheumatoid arthritis, systemic sclerosis, anky-losing spondylitis, and psoriasis) [10]. Cohen et al. reported no relation between the ABO blood group and rheumatic diseases by investigating 99 patients including 9 with SLE [11]. A retrospective study from Turkey investigated 1028 patients with different rheumatic diseases between 2016 and 2019. They reported A (31.4%) and O (31.4%) as the most frequently observed BG types in the 51 SLE patients. In this study A+ was the most common blood type in the whole population of rheumatic diseases. By comparing the patients and control group, the researchers found an inverse correlation between RH- and presence of rheumatic disease, but they did not analyze the SLE subgroup for this relation [12]. Based on these results, it seems that O and A blood groups are the most common types in SLE patients. However, in all of these studies there was no significant difference in the ABO blood group between SLE and healthy persons or other autoimmune diseases. Thus, no significant association can be found between blood groups and Lupus disease, and this relationship is still largely not understood. In their study on Behcet's disease, Ozyurt et al. obtained similar results to the current study, with A and O being the most common types and the AB group having the least prevalence [13]. Baxter et al. studied BGs in 743 rheumatoid arthritis patients. Types O (51.6%) and A (34%) were the most common, and no differences were detected between RA patients and the control group [14]. Therefore, it seems that there is no difference in the frequency of BGs between patients with lupus and the general population of patients with other rheumatic diseases [9-14].

There was also a significant relation between blood groups and skin involvement including mucosal ulcers in patients with SLE. The frequency of mucosal ulcers was significantly higher in SLE patients with AB blood group compared to other blood groups. Moreover, there was no significant relation between BGs and other organ involvements in SLE patients. As there have been few studies on the SLE disease and blood groups, few studies have examined the organ involvement in association with blood group. Therefore, the scope of this study is its strength. A large group of SLE patients were studied in this research, allowing us to determine the prevalence of different BGs and to compare the results with a healthy control group. Though some of the previous articles included large groups of patients with rheumatic diseases, the SLE subgroups were not as large as the present study. Furthermore, the current survey is the first one to investigate the relationship between blood group typing and organ involvement in SLE patients. Nonetheless, the relation between blood groups and organ involvement in lupus patients needs further study, and because this study was conducted in Kermanshah province only, it cannot be extrapolated to Iran or the world.

Conclusion

Overall, it can be concluded that there is no relationship between the frequency of blood group types in SLE patients and other members of the community. Moreover, no significant relationship was found between different organ involvements in SLE disease and blood group, except for mucosal ulcers. Therefore, it can be said that ABO blood groups cannot be used as an indicator to predict SLE disease and its organ involvement.

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Conflict of interest statement

No conflicts of interest exist.

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