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Prevalence of ABO and Rh blood groups in systemic lupus erythematosus and their association with disease activity

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Abstract

Introduction: Systemic lupus erythematosus (SLE) is an autoimmune disease whose occurrence or exacerbation is associated with various factors.
Objectives: The aim of the present study was to investigate the prevalence of different types of blood groups in SLE patients and the relationship between the disease activity of SLE and various blood groups.
Patients and Methods: This cross-sectional study was performed on 146 patients with SLE from February 2015 to October 2017. The score of disease activity was determined by SLEDAI-2K 10 days (SLE disease activity index-2K) and the blood type of all patients was determined.
Results: The most common blood type in patients studied was O blood group and then A, B and AB, respectively. The mean SLEDAI-2K scores in blood groups of A and B were significantly higher than blood groups of AB and O. The mean SLEDAI-2K score in blood group A was significantly different from non-A group ($P = 0.016$), however no significant difference between group B and non-B was seen. The mean score of the disease in blood group O is significantly lower than other blood groups ($P = 0.005$). Additionally, patients with Rh + had a significantly higher score than patients with Rh- ($P = 0.019$).
Conclusion: Since the SLEDAI in blood groups A and B is higher than the other two blood groups, in the face of aggravating factors, SLE patients with these blood groups need more care and attention.

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Introduction

Systemic lupus erythematosus (SLE) is an autoimmune disease of unknown cause that presents with a variety of clinical manifestations. In this disease, due to the production of antibodies against the cytoplasm and the nucleus of the cells, various systems such as the heart, kidneys, musculoskeletal system, skin and central nervous system are involved. The disease is accompanied by periods of blackout and recurrence (1-3). Like most autoimmune diseases, SLE is more common in women. Although SLE can occur at any age, the onset of the disease is most common in the second and third decades of life, since the average age of onset of the disease is 21 years. In children, the ratio of female to male is 3 to 1, while in fertility period this ratio is about 9 to 1. Despite the lower prevalence of the disease in men, its severity in the male population is not less than women (4,5).

There are numerous complications of SLE include cardiovascular events such as carditis and hypertension of pulmonary vessels, vascular-cerebral events, pneumonitis and encephalitis. Therefore, disease control and disease prognosis are of great importance for predicting and preventing of possible complications (6). Various factors such as ultraviolet radiation, hormonal agents, drugs (hydralazine or procainamide), chemicals, infections and genetic factors affect the recurrence and exacerbation of SLE (7,8). Blood groups are cell surface antigens that appear according to hereditary patterns and are associated with the onset or prognosis of various diseases. These include esophageal cancer, gastric carcinoma, lichen planus, small cell lung tumor (SCLC), seborrheic dermatitis, sensitivity to dermatophytes, and breast cancer (9). More than 30 proteins and sugars are known as blood group markers, among which the highest antigenic properties are related to ABO and Rh (D) systems, which are expressed by 9q34 and

Key point

In a cross-sectional study on 146 patients with SLE, we found the SLE severity of blood groups A and B is higher than that of the other two blood groups.

1p36 genes, respectively (10).

In various studies conducted around the world, the distribution of blood groups in different communities has been studied. In a study conducted by the blood transfusion organization of Iran, the prevalence of blood types was 37.62% blood type O, 25.30 % blood type A, 36.24% blood type B, and 7.77% blood type AB, respectively. Of which 89.92% had Rh + and 10.08 ٪ Rh - (11).

Objectives

Due to the fact that so far no comprehensive study has been conducted on the prevalence of blood types in SLE patients in Iran and the limited other studies have only examined the prevalence of blood groups, the present study aims to investigate the prevalence of blood types in SLE patients and the relationship with SLE disease activity.

Patients and Methods

Study design

The present study was a cross-sectional conducted on 146 patients with SLE who referred to Al-Zahra and Noor outpatient clinics from February 2015 to October 2017. All patients who had SLE according to the ACR criteria (American College of Rheumatology criteria) (12).

In order to participate in the study, all the required information and consent forms were provided to the patients, and the patients who wished to participate in the study completed the necessary checklists (including demographic information and medical records).

For estimating of disease activity score SLEDAI-2K 10 days (SLE disease activity index-2K) was used by the rheumatologist. Patients with a total of at least one 4-point item out of a total of 105 scores were considered active SLE. Blood samples were taken from all patients participating in the study that filled out the consent form to determine the type of blood type and then determined by the antigen-antibody method (slide method). All tests needed to determine the SLE activity were conducted for patients.

Ethical issues

The research was conducted in accordance with the tenets of the Declaration of Helsinki. The Ethics Committee of Isfahan University of Medical Sciences approved this study (Ethical code# ir.mui.rec.1396.3.241). Accordingly, written informed consent was taken from all participants before any intervention. This study was conducted as the M.D, thesis of Ali Hajihashemi at the rheumatology department of this university.

Statistical analysis

After collecting the data, the data were analyzed using SPSS software version 23 (version 23, IBM Corporation, Armonk, NY) and statistical tests of *t* test and one-way variance, followed by LSD post hoc. $P<0.05$ was considered as the significant level.

Results

In the current study, 146 patients with SLE who were active according to the SLEDAI-2K system of SLE were examined. Of these, 140 (95.89%) were women and 6 (4.11%) were men. In this study, the mean age of the patients was 37.65 ± 12.29 years and the duration of the disease was 5.42 ± 3.60 years. The mean score of SLEDAI-2K in the patients was 19.77 ± 14.10. According to the findings of the current study, the longer duration of SLE, was associated with higher SLEDAI ($P=0.001$, r = 0. 294).

In this study the numbers and percents of blood groups A, B, AB and O were 41 (28.8%), 39 (26.71%), 16 (10.95%) and 50 (34.24%) respectively (Table 1). Of 146 study people, 116 (79.45%) were Rh + and 30 (20.55%) were Rh-. The mean SLEDAI-2K scores in blood groups A, B, AB and O were 24.78 ± 16.753, 22.87 ± 15.416, 14.00 ± 7.448 and 15.68 ± 10.036, respectively. The results of one-way analysis of variance showed that the mean SLEDAI-2K score in blood group A was significantly different from blood groups AB and O ($P=0.008$ and $P=0.0002$ respectively). This means that the SLEDAI-2K score was higher in patients with blood type A than in the other two blood groups.

Additionally, the SLEDAI-2K score was significantly higher in patients with blood type B than in blood groups AB and O ($P=0.029$ and $P=0.014$), respectively (Table 2).

Proteinuria and arthritis as the two most important criteria for SLE did not differ significantly in different blood groups. Additionally, the prevalence of vasculitis in blood group O was significantly lower than other non-O blood groups ($P=0.028$).

In another comparison with t-test, the mean SLEDAI-2K score in blood group A was significantly different from non-A group ($P=0.016$). In a similar comparison, no significant difference between group B and non-B was detected (Table 1).

Comparison of blood group O with non-O group shows, the mean score of disease activity of patients is significantly lower than other blood groups ($P=0.006$).

A study by *t* test on Rh blood groups showed that patients with Rh positive had significantly higher disease activity than Rh negative patients ($P=0.019$).

Table 1. Comparison of the average SLEDAI in different blood groups

Blood groups	Mean ± SD	No. (%)	*P* value
A	24.78 ± 16.753	41 (28.08)	0.016*
Non-A	18.10 ± 12.499	105 (71.92)	
B	22.87 ± 15.416	39 (26.71)	0.367
Non-B	18.92 ± 13.499	107 (73.29)	
AB	14.00 ± 7.448	16 (10.95)	0.026*
Non-AB	20.71 ± 14.552	130 (89.05)	
O	15.68 ± 10.036	50 (34.24)	0.006*
Non-O	22.21 ± 15.375	96 (65.76)	

* Indicates a significant difference (one-way ANOVA test).
SLEDAI, systemic lupus erythematosus disease activity index.

Table 2. *P* value from comparing the SLEDAI in different blood groups

Blood groups	A	B	AB	O
A	-	0.529	0.008*	0.002*
B	0.529	-	0.029*	0.014*
AB	0.008*	0.029	-	0.666
O	0.002*	0.014*	0.666	-

* Indicates a significant difference (*t* test).
SLEDAI, systemic lupus erythematosus disease activity index.

Discussion

As mentioned, in various studies, the occurrence or exacerbation of many diseases has been associated with a variety of blood groups. These include esophageal cancer, gastric carcinoma, lichen planus, SCLC, seborrheic dermatitis, sensitivity to dermatophytes, and breast cancer (9).

Various studies have also examined the association of different blood types with autoimmune diseases. Çildağ et al found that ankylosing spondylitis, vasculitis, rheumatoid arthritis, and Behcet's disease were more common in patients with blood type A, while SLE, Sjogren's disease, familial Mediterranean fever, and systemic sclerosis were more common in patients with blood type O (13). To determine the prognosis of any disease, there are several factors that directly or indirectly affect the severity and prognosis of the disease. SLE is no exception and various factors are effective in exacerbating it. These factors include sunlight and some medications, especially hormonal drugs, infections, and genetic factors. One of the least studied cases in SLE patients is the issue of blood types.

Initially, 146 patients with active SLE were examined after removal of patients who did not have active SLE. Demographic, clinical, and laboratory data were collected and evaluated. Previous reports indicate a higher prevalence of SLE in women than in men, since the results of the present study confirm this (4,5). The most common blood type in patients studied was O blood group, followed by A, B, and AB, respectively. Additionally, as expected, blood type Rh+ was more common than Rh-. In our study, the prevalence of blood groups in normal society was not studied, however in a study conducted by the Iran Blood Transfusion Organization, the prevalence of blood groups O, A, B and AB was 37.62%, 25.30%, 36.24% and 7.77% respectively, of which 89.92% had Rh+ and 10.08% have been Rh- (11). Hence, in our study the frequency distribution of different blood groups in patients with SLE was similar to the normal population. In a study by Lildağ et al on patients with SLE, the most common blood types were O and A, B, and AB, respectively. In this study, 95.7% had Rh+ and the rest had Rh-. The results of this study are consistent with our results regarding the prevalence of blood groups in SLE patients. In the study of Çildağ et al, only the prevalence of blood groups has been studied while the activity of SLE has not been evaluated (13). In another study by Tamega et al on patients with discoid lupus, the most common blood types were A, followed by O, B, and AB respectively, which is not consistent with our results. Given that the present study examined all types of lupus involvement, including the type of discoid, this difference could be due to differences in the type of study design. Additionally, in the study by Tamega et al, 88.4% of patients were Rh + and 11.6% were Rh- (9), which is similar to the findings of our study. In a study conducted by Ottensooser et al, on 45 patients with SLE, the frequency of blood groups B and AB was much higher than that of the control group (14). A noteworthy point in our investigation is the evaluation of lupus activity with different blood types, which has not been studied previously.

Patients with blood type A had higher SLEDAI-2K than those with blood type AB and O, and this difference was significant. Therefore, it can be said that patients with blood type A compared to AB and O blood groups have experienced a more active disease.

There was also a similar situation for blood type B compared to blood groups AB and O, meaning that patients with blood type B also had a more SLEDAI-2K than the two groups above.

Comparison of disease activity in patients with groups A and B does not show a significant difference, therefore the disease activity in these two blood groups is similar.

Although O blood type was the most common blood type in patients with SLE, the disease activity was lower in people with this blood type than in blood groups A or B.

This seems different in the case of Rh, as patients with Rh+ blood type have both a higher prevalence and a higher incidence of the disease activity compared to Rh- patients. In general, patients with blood type A had a more active disease compared to the non-A group, and patients with blood group O had a milder disease than the non-O group. Among those surveyed, the duration of SLE was significantly associated with the SLEDAI-2K score. Accordingly, the study by Ibanezet al showed similar results (15). It is important to note that this score is more likely to be related to the side effects of medications or the duration of medication. This means that apart from the length of time it takes to diagnose SLE, the longer duration of treatment, and the greater likelihood of not responding to treatment, can lead to higher SLEDAI-2K scores (15,16). ABO and Rh blood groups are practical clinical factors that can be used as genetic evaluation. In this study, we believe that the greater activity of SLE in some blood groups is associated with different genetic predispositions. In a 2009 study by Tamega et al, blood type A was significantly associated with the diffuse form of discoid lupus, meaning that a higher percentage of patients with blood type A compared with other blood groups had the diffuse form of discoid lupus (9).

Conclusion

Our study showed the severity of SLE in blood groups A and B is higher than in the other two blood groups, Therefore, it may affect or exacerbate SLE. SLE patients with these blood types need more care.

Limitations of the study

One of the limitations of the present study was the type of drugs used by patients that have different effects on disease activity.

Authors' contribution

MK and AH were the principal investigators of the study. HRM was included in preparing the concept and design, and also revisited the manuscript and critically evaluated the intellectual contents. All authors participated in preparing the final draft of the manuscript, revised the manuscript and critically evaluated the intellectual contents. All authors have read and approved the content of the manuscript and confirmed the accuracy or integrity of any part of the work.

Conflicts of interest

The authors declare that they have no competing interests.

Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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